THE IRON TRADE REVIEW

A JOURNAL OF THE IRON, STEEL, MANUFACTURING AND TRANSPORTATION INTERESTS OF THE CENTRAL WEST.

VOLUME XXI. CLEVELAND, O., OCTOBER 11, 1888. NUMBER 42.

DRILLING MACHINES,

All Styles.

UPRIGHT DRILLS,

20 to 38 inch Swing.

Latest designs and improvements. All fitted with our patent quick return of the spindle.

For cuts and prices address

BICKFORD DRILL CO.,

170 to 180 E. Front St., Cincinnati, O.

UNIVERSAL RADIAL

RADIAL DRILLING MACHINES

THREE DESIGNS, SIX SIZES

EMBODY ALL DESIRABLE FEATURES

PRICES $450.00 & UPWARD

ADDRESS UNIVERSAL RADIAL DRILL CO CINCINNATI O U.S.A.

Emery Wheel Machinery.

J. WENDELL COLE, M.E.

Manager of Pennsylvania Southern Lake regions, and the Northwest for

DETROIT EMERY WHEEL CO.

Address: Box 84, Columbus, O. or P. O. Box 152, Chicago.

Hart's Corundum-Emery Wheels

E. C. ATKINS & CO.

INDIANAPOLIS, IND. and MEMPHIS, TENN.

MANUFACTURERS OF

CROSS-CUT, CIRCULAR, BAND AND GANG SAWS.

FINE SAWS A SPECIALTY.

SOLE MANUFACTURERS OF THE FOLLOWING BRANDS CROSS-CUT SAWS:

Silver Steel Diamond, Concave Tooth Dexter, Special Steel Diamond, Original Tuttle Tooth Improved, Extra Quality One-Man and Narrow Cross-Cut Saws.

ALL LUMBERMEN REQUIRE CROSS-CUT SAWS.

USE ONLY THE BEST.

Our CROSS-CUTS are acknowledged as "Incomparably the best in use," and are. We are Agents for Tanite Emery Wheels and Grinding Machinery.

SYKES IRON ROOFING CO., NILES, O.

SYKES' IMPROVED Best Roof in the World. Suitable for all classes of Buildings. Easy Put On.

All my Iron is Re-Rolled and Box Annealed, well Painted on both sides with Best of Paint and Pure Linseed Oil.

Send for Circular and Price List, and mention this Paper.

TOLEDO WIRE WORKS.

F. POWELL & CO.

Manufacturers of

COAL SCREENS

WIRE BANK RAILINGS,

PLANT STANDS,

FIRE PROOF LATHING, &c.

Summit Street, TOLEDO, O

PATENTS.

M. D. & L. L. LEGGETT,

Attorneys at Patent Law

Patents obtained in the United States and al Foreign countries. 53

Masonic Building. CLEVELAND, O.

E. H. JONES & CO.,

223 and 225 River St., CLEVELAND, O.

Engineers and Contractors.

Worthington Steam Pumps,

Electric Light Engines

AND

Automatic & Slide Valve Engines

Of all Descriptions.

STEAM PLANTS, COMPLETE, FURNISHED AND SET UP.

PRESSED WROUGHT IRON OPEN TURNBUCKLES.

THE BEST and CHEAPEST.

—MADE BY—

CLEVELAND CITY FORGE & IRON CO., Cleveland, O.

The ECLIPSE

COPYING APPARATUS

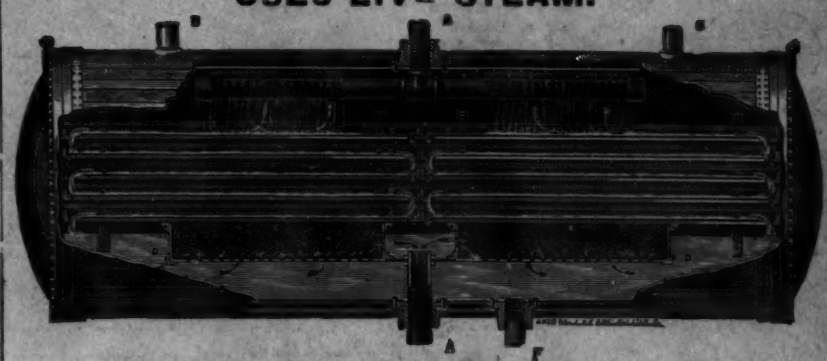
One thousand copies in black. No special pen, no special paper, no stencil required. The "Eclipse" reproduces the natural handwriting so exceedingly faithful that in most cases "Eclipse" circulars have been taken for ordinary written letters. Specimens and circulars on application.

FELIX F. PAUS & CO.,

698 Broadway, N. Y.

New Feed Water Purifier and Filter.

USES LIVE STEAM.



ILLUSTRATED CATALOGUE FREE.

STILWELL & BIERCE MANUFACTURING CO.,

DAYTON, OHIO.

The Kilby Manufacturing Co.,

CLEVELAND, OHIO,

—SUCCESSORS TO—

The Prospect Machine & Engine Co., of Cleveland, O., and Barney & Kilby, of Sandusky, O.

Recent extensive additions to our Shops and Machinery makes our Plant one of the largest and best equipped in the country.

We are now prepared and have facilities for doing Foundry and Machinist work of every description. Shall be glad to furnish estimates on application for Engines, Boilers and other heavy Machinery. 72-1y

Machinery Manufacturers' Association

—FOR SUPPLYING—

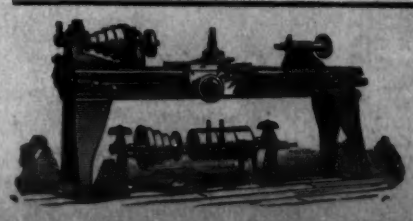
MACHINE SHOPS, FOUNDRIES, PLANING MILLS, PAPER MILLS, ROLLING MILLS, FLOURING MILLS, MINES, CAR-SHOPS, RAILWAYS, ETC.,

With MACHINERY, TOOLS, and other EQUIPMENTS, at the Makers' Lowest Prices.

I. H. PRATT, Manager.

OFFICE: 803½ St. Clair St. Opp. Kennard House, CLEVELAND, Ohio.

WRITE FOR PRICES.



NEW AND IMPROVED

17-Inch Engine Lathes.

Any length of bed. Workmanship strictly first-class.

THE MULLER MACHINE TOOL CO.

39th and Evans Sts., (441) CINCINNATI O.

Cyrus Tyler
WIRE WORKS CO.

MANUFACTURERS OF

WIRE CLOTH

Of Every Description,

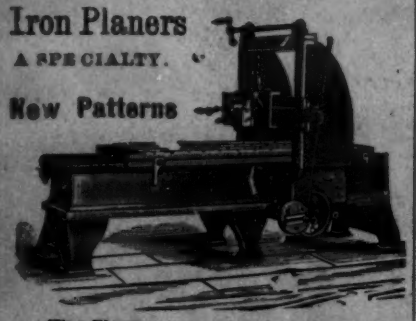
Office Railings,
Elevator Enclosures,
AND ALL KINDS OF
Architectural Wire and Iron Work.

W. S. TYLER, President. E. M. ALLEN, Sec. & Treas.
CLEVELAND, OHIO.

Iron Planers

A SPECIALTY.

New Patterns

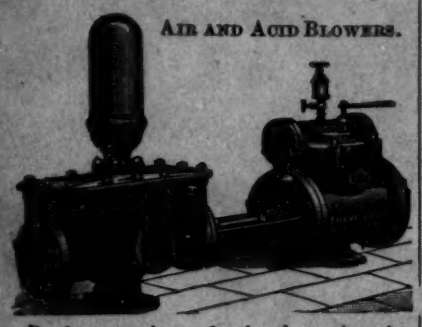


This Planer returns the table 8 for 1.
Sizes from 30 in. by 30 in. and 36 in. by 36 in. to plane from 4 to 10 feet in length.

Rochester Machine Tool W'ks
LIMITED,
84 Rochester, N. Y.

Locke Patent Steam Pumps.

AIR AND ACID BLOWERS.



For fire protection, refineries, breweries, pipe lines, etc. Pumps and Blowers fully Guaranteed

YOUNG & LOCKE, Titusville, Pa.
Box 991. 43

The Fairy Tricycle.
Easy, Cheap, Healthful, Graceful. Best for girls, adults and invalids. Only practical machine for cripples to run by hand power. For circulars, address FAY MFG. CO., Elyria, O.

AMERICAN

FOUNDRY PRACTICE.

TREATING OF

Loam, Dry Sand and Green Sand Moulding,

AND CONTAINING

A Practical Treatise upon the Management of Cupolas and the Melting of Iron.

BY THOS. D. WEST,

Practical Iron Moulder and Foundry Foreman. Fully Illustrated.

Sent by Mail, Postage Paid, on Receipt of Price, $2.50.

Cleveland Printing and Pub. Co

Cleveland, Ohio

FREIGHT AND PASSENGER

ELEVATORS

L. S. GRAVES & SON,

Corner Center and Frank Streets, Rochester, N. Y.

New York Office, 46 Cortland St.; Cleveland Office, 208 Superior St.

Send For Our Catalogue.

Fabric Fire Hose Co.,

MANUFACTURERS OF

Cotton Fire Hose.

FOR

MILLS AND FACTORIES.

HOSE JUMPERS. RACKS & REELS.

5 Barclay Street, NEW YORK.

JAMES P. WITHEROW,

Engineer and Contractor,

Lewis Block. Pittsburgh, Pa..

General Agent for

Whitwell Fire-Brick Stoves and Clapp-Griffiths Patents

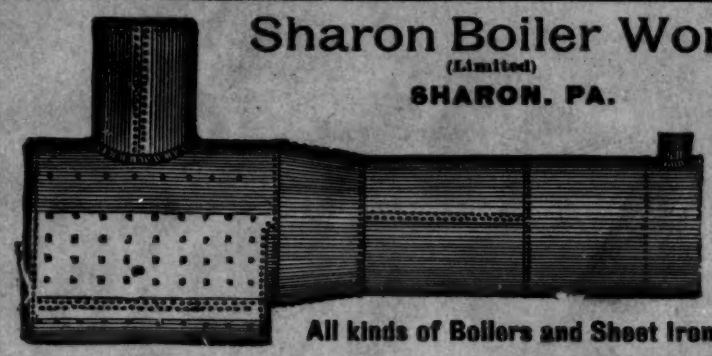
For the Manufacture of Soft Steel.

Specially adapted for A No. 1 Boiler Plates, Boiler Rivets, Wire Rods, Stay Bolts, Stamping ware, Nail Plates, etc. Will contract to completely erect, equip and place in operation blast furnaces, Whitwell stoves, and steel plant s as above. As I manufacture at my own works everything appertaining to blast furnace and steel works construction I can guarantee promptness and satisfaction ! 81

Sharon Boiler Works,

(Limited)

SHARON, PA.



All kinds of Boilers and Sheet Iron work.

Fulton Steam Boiler Works,

JOHN T. CAULFIELD, Proprietor.

Manufacturer of

Steam Boilers,

—ALSO—

SMOKE STACKS, TANKS, PANS, BREACHINGS, HEATERS, Etc.

Write for Estimate. Works just north of Union Passenger Depot.

RICHMOND, Ind.

IMPROVED VICTOR SAW FILER.

Latest and best machine for Filing Saws of every description. Absolute in action. Elegant in finish. Reasonable in Price. Descriptive circular sent on application.

Price complete $2.50.

Address,

Robt. J. Schaeffer & Co.,

[221y] DAYTON, O.

HUGHES STEAM PUMP CO.

MACHINISTS

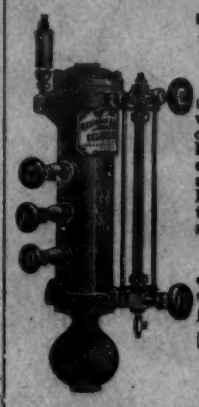
and Manufacturers of

Steam Pumps,

Hydraulic Presses,

And General Machinery.

Elm, cor. Washington Street. CLEVELAND, O



The Reliance Safety Water Columns

Cost a trifle more than the ordinary combination which they replace but are cheaper than explosions, burned flues, shut-downs, etc. They afford insurance against damage by either low or high water during the life of the boiler for about $10 to $20.

Can you afford to carry the risk?

Sold by dealers generally. Send for Illustrated Price List.

RELIANCE GAUGE CO.
236 Sheriff St.,
CLEVELAND, OHIO.

PATENTS.

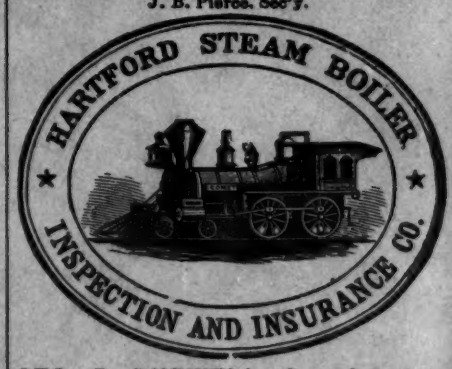
JOSEPH A. OSBORNE,

Patent Attorney,

29 EUCLID AVE., CLEVELAND, OHIO.

Patent Causes litigated in the United States Supreme and Circuit Courts. UNITED STATES AND FOREIGN PATENTS SECURED. Searches and Opinions as to the Scope, Validity and Infringement of patents. Terms Reasonable.

J. M. Allen, Pres. Wm. B. Franklin, V. Pres
J. B. Pierce, Sec'y.



GEO. P. BURWELL, Gen. Agent.
246 Superior St.,
CLEVELAND, O.

A. C. GETCHELL,
9 Chief Inspector.

E. GOULD & EBERHARDT, NEWARK, N. J.

EBERHARDT'S NEW DRILL. APPLY TO

Turns out 20 per cent. more work than any other.

THE IRON TRADE REVIEW

A JOURNAL OF THE IRON, STEEL, MANUFACTURING AND TRANSPORTATION INTERESTS OF THE CENTRAL WEST.

VOLUME XXI. CLEVELAND, O., OCTOBER 11, 1888. NUMBER 42.

TOOLS FOR WORKING SHEET METAL.

On this page are given illustrations of several interesting tools for working sheet metal, recently brought out by the well known firm of Bertsch & Co., Cambridge City, Ind. Figure 1 shows their extra heavy back-geared No. 2 power shear, with 15″ throat combined, for squaring and slitting, to cut No. 6 or 3-16″ plate iron and lighter. Of this tool the manufacturers say: "We beg to call particular attention to our improved light and heavy No. 2 power shears (as herewith illustrated) which are made in all sizes up to 10 ft. long, with 12″, 15″ or 18″ open throat, for trimming and slitting. Strips can be cut regardless of length from ⅝″ up to 15″ wide, the width of the throat. For trimming or slitting the extension or drop-leaf tables are of importance. The table on the left, is detached and the table on the right is in proper position for slitting and trimming with the extra adjustable parallel on surface gauge, bolted on said table and adjusted in direct line with the blades to insure straight, continuous cutting, and avoid marking off the metal, which is of merit. For cutting strips, the back gauge is also used. The shear is provided with our late improved automatic quick adjustable hold-down. Same is quick to let go when cut is made. The hold-down is placed near blades, and will raise up ample high, and is arranged to admit all the light possible, so the operator can see the mark, to properly and quickly adjust the metal. The adjusting swivels on same are provided with an endless link-belt chain, and sprocket wheels on same, which enables the operator to conveniently adjust the clamp bar accurately, both ends at one time for light or heavy metal. The shear is provided with our late improved automatic shifting clutch. By slightly depressing the treadle, the shear will start quickly and stop every cut accurately when the blade is at the highest point, or if desired, can let the shear run on continually. The shear is extra strong in all the working parts. The balance weights or springs are to give it a steady motion. Long shears are provided with our patent center bearing, which is attached direct behind the knife-bar to prevent it from springing. These shears can be run fast or slow, and the gearing can be attached to either side of shear. We can furnish a similar shear with 21″ or 24″ throat for slitting wide sheets."

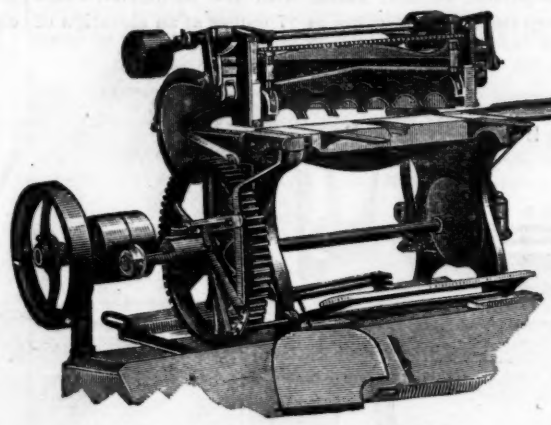


Fig. 1.—EXTRA HEAVY POWER SHEAR.

Fig. 2.—LIGHT POWER SHEAR.

Fig. 3.—PUNCH AND SHEAR.

Fig. 2 represents their No. 2 light power shear for No. 16 iron and lighter. It is the same design as Fig. 1, only lighter, and the fly-wheel is placed direct on the driving shaft.

Fig. 3 shows their improved labor-saving tool-punch and shears. It is made in several different sizes, for a general line of sheet iron work, etc. The working parts are not combined, as will be seen, and therefore can be operated by one man, which is more desirable; otherwise when the parts are connected or combined, it will require two men to punch. In this case it also requires extra attachments to connect the movements, which will cause more friction and wear, and more trouble if any part is out of order or broken. One man can operate the punch from front or back. The punch is powerful and durable, and is thick and wide to prevent springing large bearings. It has a steel eccentric, steel plunger and steel yoke and box, as well as quick adjustable dies, comprising three sets. The operator can see the mark to punch, as the stripper or take off is attached direct behind the plunger, and the tool is specially arranged to afford all the light possible. It can punch near the edge of the metal if desired, such as flanges and angle, iron, and can also punch holes in the end of 5″ pipe or ring or larger, making it desirable for a general line of work for boiler-makers, stack-makers, railing-makers, carriage and wagon shops, etc. The cut represents the No. 7; it is amply strong to punch ⅝″x⅜″ with ease. Eight inch throat and 10″ blades will cut ¼″ plate iron on ⅝″x2″ bar, or ⅝″ round iron. Weight, 450 lbs.; smaller sizes will weigh from 150 to 400 lbs. Extra large, 600 lbs.

Fig. 4 (page 698) represents their latest improved No. 2 shear combined, for squaring, trimming and slitting sheets of any length. Strips can be cut up to 15 inches wide, as desired, and of any length. The tool can also cut a 30-inch sheet through the center, and can cut all around a sheet. This cut represents the shear complete, with the lever attachment and hold-down and the drop leaf tables. They are made in all sizes, with 12-inch or 15-inch open throat, and with or without the lever attachment and hold-down or the drop leaf tables. The drop leaf tables are attached on a hinge form on each end of shear at R, to fold down, as shown, or can be taken off, if desired, by drawing out the rod R. An extra parallel gauge is attached to the drop leaf table especially for trimming sheets, and is also convenient for slitting. This gauge is not shown; it is about 30 inches long, for a 31 or 37-inch shear, and is bolted on one side of the drop leaf table, and adjusted in direct line with the blades to serve as a guide for the edge being cut, for continuous cutting, to insure straight cutting and avoid marking off. The tables are of considerable importance for cutting long sheets, or in doing various small work speedily. The lever is used principally for cutting heavy metal, or a number of lighter pieces at one time. The lever and treadle can be used conjointly, if desired. For light work, the treadle is used with perfect ease, independent of the lever, same as the ordinary square shear. L, the lever shaft, with cams C on the outer ends of the shaft, to work in connection with the forked side arms and knife bar, when the lever is used. W represents friction wheels, 2½ inches in diameter, which are pivoted on the front ends of said arms for the cams C on shaft to turn around on, to depress the knife bar in case the lever is used, which gives a more steady and powerful motion than the treadle.

The hold-down is attached on the lever shaft L, and is operated by one motion of the lever H, which is connected to the hold-down by adjusting eye-bolts at A, for adjusting, if desired. Convenient and quick to operate, self-supporting when up or down. When down, the connecting part at A will be in direct line with each other under the lever shaft, so as to be self-holding or locking, and can not raise while cutting. There is no obstruction in the way whatever. The hold-down will elevate 2½ inches, and is placed ½ inch near the upper knife. If desired, it can be taken off by removing one bolt at A. The patented forked arms will allow the sheets to pass through for slitting; are pivoted to the back side of the shear legs, which are also throated to correspond. The upper arms, connected to the cutter bar, work free on a round bearing, similar to a ball bearing in a pocket or mortise, to receive said arms. This bearing, or pocket, is slightly on the back side of the cutter bar, so as to draw the blades still closer together when depressed; the lower arms connecting to the treadle are longer than the upper arms, which will also afford greater power for the treadle.

B, on small cut (Fig. 5, page 698) represents two holes in the treadle for the pitman, to afford greater power when bolted in the back hole, or to raise or lower the treadle. These bolts connecting the rod are extra strong, and have a thread on the end, and are properly screwed in their places, and have wide bearings.

D represents a patent table adjustment, which is composed of a bolt in connection with the adjusting set screws, placed below the set screws with a nut on the outside and the head on the inside of the table, and when both are tightened up it will make a complete lock, and hold all parts more rigid. No hammering required to adjust the table forward or back, the former drawing and the latter pushing, one counteracting against the other. G, the back gauge (Fig. 5, page 698) and H, the hold-down and front gauge detached. The squaring gauge is provided with plain pins instead of screws, so that the gauge can be readily lifted off for slitting.

Fig. 5 (page 698 represents a 31-inch shear, with the lever attachment on, and hold-down and drop leaf tables detached. This shear has 12-inch gap or throat complete, for tin or iron; will cut No. 16 iron, with the lever attachment. Strips can be cut with this shear up to 12 inches wide, as desired, and of any length. The manufacturers add: "We guarantee the above shears to be just as convenient for any small tin shop as the best ordinary square shears. Our combined shears are absolutely indispensable for a general line of work. They embody many superior advantages and points of merit. They are made in all sizes, up to 10 feet long; also made to operate by power, for light or heavy work, up to No. 10 iron, and are provided with automatic, self-working hold-down, or hand operating, as desired. We have improved patterns, for light and heavy power sheers, to cut from No. 10 to a thickness of ⅜ inch iron or steel."

THE largest carpet in the world is at the Cincinnati Exposition. It measures 2,700 yards in area.

THE IMPORTANCE OF VACUUM.

BY W. H. BOOTH.

One of the very best engineers with whom I have been acquainted was a man who had charge of the engines in a large cotton mill. They were old-fashioned engines. One set was made up of a pair of high-pressure horizontal slide valve engines which exhausted their steam into a large pair of old-fashioned beam engines. The other set consisted of a pair of vertical engines exhausting into a very antiquated pair of side lever marine engines, made by the firm of Boulton & Watt, and such as were formerly used for paddle steamers. Steam for this old gear was obtained from boilers which only carried 60 pounds pressure.

The results of such an old-fashioned plant may be supposed to have been but poor, but such was by no means the case, for throughout the year the coal consumption per hour per indicated horse-power was only 2¼ pounds, including the steam used for both warming purpose and for sizing of yarn, there being a large weaving shed attached. The secret of this economical working was, apart from a correct mode of working the steam, the great care exercised to prevent leakage of air into the exhaust pipes and condenser; where a joint was doubtfully tight it was well painted, and all pipes, such as injection, exposed to greater external than internal pressure, were kept well painted. One result of this care was, that after the hours' stoppage at noon, the vacuum gauge on the condenser would indicate 12 pounds. The ordinary working vacuum obtained 14 pounds, fully—a so nearly perfect vacuum that it is doubtful if it was practicable to improve it, as the mill was by no means down to the sea level. This is equal to 28½ inches by the mercury column, an atmosphere being almost 30 inches. The absolute pressure in the condenser was thus only 1½ inches, roughly. I have heard it argued that such a good "vacuum" is impracticable, but this is not the case, as a little calculation will show, for it has been determined that the temperature of aqueous vapor may be ascertained by the following rule from its pressure F in inches of mercury. (Find the sixth root of a number of inches of mercury. Multiply the number thus found by 177, and subtract 100 from the product. The remainder is the temperature of the water in degrees Fahrenheit, whose vapor has the tension F inches of mercury.)

Applying this rule to the question in hand, we require to use a table of logarithms, from which we find that the logarithm of 1½ is 0.17609, and one sixth of this is 0.02935. The logarithm of 177 is 2 24797. The product of these two logarithms is 2 2773, which is the logarithm of 190 nearly. Then 190°—100°=90° Fahrenheit, as the temperature of the hot well. That is to say, if there were no air present in the exhaust steam, and no air leaked in through bad joints and pores, a vacuum of 14 pounds would always be obtained, so long as the supply of injection water was sufficient to give a hot well temperature of 90°. This fact gives rise to further reflection, for it shows how important it is that an intelligent engineer should thoroughly understand the connection which exists between the vacuum gauge and the hot well temperature.

A knowledge of mathematics is not requisite, nor the ability to work by logarithms. All that is required is an ordinary table of the properties of steam, such as is found in almost all engineers' pocket books, such as Molesworth's, now before me, in England, or Nystrom's, Haswells, etc., in America. In the table before me I find that a vacuum of 3 7-10 pounds, equivalent to 27 9-10 inches on the mercury column, ought to be obtained with a hot well temperature of 102°.

Now, if I examine an engine and find the hot well is only 90°, and the vacuum only 13 7/10 pounds, instead of 14 pounds, I know that the difference is due to the presence of air, and my first step would be to gradually close down the injection valve, keeping my eye on the vacuum gauge, which ought, when in its right place, to be facing the engineer, as he stands at the valve. I should continue to close this valve until the vacuum gauge began to go back, when I should open up a very little again, and try the hot well temperature. If this were now 100°, I should know that the condenser was almost perfect as a condenser, and any further effort would be to improve the action of the air pump; but however high stood the gauge, I should always use the smallest quantity of injection water possible, and consistent with the vacuum.

There are good reasons for this. First, the power required to work the air pump is reduced to a minimum. Secondly, the boiler feed, which is taken from the hot well, is as hot as possible, and so I save fuel. Thirdly, the chilling effect, if any, upon the cylinder, is less. In every engine house having a condensing engine there should be hung up alongside the vacuum gauge a table showing the pressures and temperatures of what I will term "vacuum" steam:

Vacuum in Pounds.	Vacuum in Inches of Mercury.	Absolute Pressure in Inches of Mercury.	Absolute Pressure in Pounds.	Temperature.	Remarks.
8 7	17.71	12.21	6.0	170.2	
9.7	19.74	10.17	5.0	162.3	Poor.
10.7	21.78	8.14	4.0	153.1	Medium.
11.7	23.81	6.10	3.0	141.6	Fair.
12.0	24.43	5.49	2.7	138.0	Ordinary.
12.7	25.85	4.07	2.0	126.3	
13.0	26. 6	3.46	1.7	117.0	Good.
13.7	27.89	2.05	1.0	102.1	
14.0	28.50	1.42	0.7	87.0	Excellent.
14.7	29 93	0.00	0.0	77.0	Perfect Vacuum.

Such a table, with its remarks, is really only accurate with the barometer at 30 inches, and, strictly speaking the perfect vacuum varies with the barometer, and I have seen this fall as low as 27 inches at an elevation of less than 500 feet, so that in such wea her no engine could get better than 13 pounds' vacuum. Thus, a barometer should always hang alongside the vacuum gauge. Indeed, the two columns should stand side by side, and rise from the same vessel of mercury.

Whilst on the subject of vacuum, it may be added that, when indicating an engine, the indicator should be placed also upon the condenser, which should have a tap inserted for the purpose. No accuracy is to be expected in a test when the condenser vacuum is taken from the gauge, the boiler pressure from another gauge, and so on. These, of course, should be noted on each card as taken, but the variation of these different gauges should always be ascertained by taking on one set of cards every particular, and drawing a line for both the boiler pressure and condenser, with same spring as used for the cylinder, reading the gauges carefully at the time, in order that all readings may be corrected to a uniform standard.

In conclusion, I would just note that one application of tar to a rather long injection pipe improved the vacuum one-half pound in an engine once tested by me. This appears simply due to the stoppage of minute pores in the cast iron pipes.—[American Machinist.

A COMPAMY with a capital of $1,000,000 will develop 20,000 acres of iron and timber lands in Cherokee county, Tex. The product of the iron beds, they say, cannot be excelled.

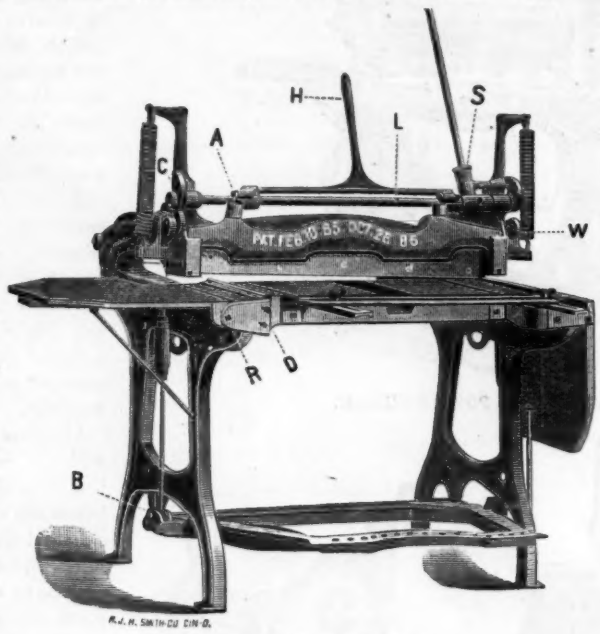


FIG. 4.—SHEAR COMBINED.

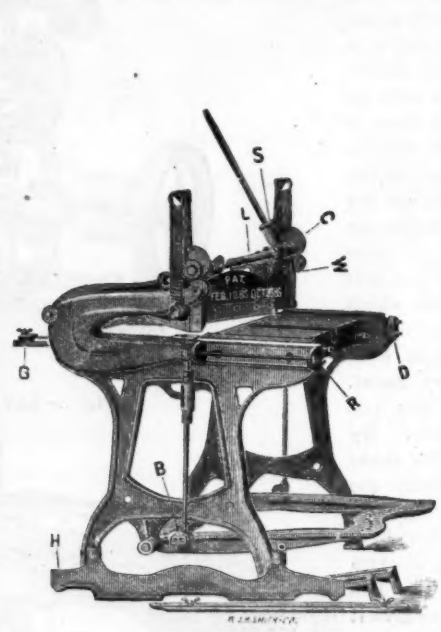


FIG. 5.—H-I CH SHEAR.—(See first page.)

FUTURE OF THE STEAM ENGINE.

The annual meeting of the British Association for the Advancement of Science, lately held at Bath, England, was opened by an address by Sir Frederick Bramwell, the president of the association, in which he repeated a prediction made by him at a former meeting of the association regarding the displacement of the steam engine in the future. He said it was a sad confession to have to make, that the very best steam engines only uti ize about one-sixth of the work which resides in the fuel that is consumed, though at the same time it was a satisfaction to know that great economical progress had been made, and that the 6 pounds or 7 pounds of fuel per horse-power per hour consumed by the very best engines of Watts' days when working with the aid of condensation is now brought down to about one-fourth of this consumption. Continuing, he said: At the York meeting of our association, I ventured to predict that unless some substantial improvement were made in the steam engine (of which improvement, as yet, we have no notion) I believed it days for small powers were numbered, and that those who attended the centenary of the British Association in 1931, would see the present steam engines in museums, treated as things to be respected, and of antiquarian interest by the engineers of those days, such as are the open-topped steam cylinders of Newcomen and of Smeaton to ourselves. I must say I see no reason, after the seven years which have elapsed since the York meeting, to regret having made that prophecy, or to desire to withdraw from it. The working of heat engines, without the intervention of the vapor of water by the combustion of the gases arising from coal, or from coal and from water, is now not merely an established fact, but a recognized and undoubted commercially economical means of obtaining motive power. Such engines, developing from 1 to 40 horse-power, and worked by ordinary gas supplied by gas mains, are in most extensive use in printing works, hotels, clubs, theatres, and even in large private houses, for the working of dynamos to supply electric light. Such engines are also in use in factories, being sometimes driven by the gas obtained from "culm" and steam, and are given forth a horse-power for, it is stated, as small a consumption as one pound of fuel per hour. It is hardly necessary to remind you—but let me do it—that although the saving of half a pound of fuel per horse-power appears to be insignificant when stated in that bald way, one realizes that it is of the highest importance when that half pound turns out to be 33 per cent. of the whole previous consumption of one of those economical engines to which I have referred. But, looking at the wonderful petroleum industry, and at the multifarious products which are obtained from the crude material, is it too much to say that there is a future for motor engines worked by the vapor of some of the more highly volatile of these products—true vapor—not a gas, but a condensable body capable of being worked over and over again? Numbers of such engines, some of as much as 4 horse-power, made by Mr. Yarrow, are now running, and are apparently giving good results; certainly excellent results as regards the compactness and lightness of the machinery; for boat purposes they possess the great advantage of being rapidly under way. I have seen one go to work within two minutes of the striking of the match to light the burner. Again, as we know, the vapor of this material has been used as a gas in gas engines, the motive power having been obtained by direct combustion. Having regard to these considerations, was I wrong in predicting that the heat engine of the future will probably be one independent of the vapor of water? And further, in these days of electrical advancement, is it too much to hope for the direct production of electricity from the combustion of fuel?—[Bradstreets.

AT Erie, Pa., a well has been bored 3,500 feet. The Schladeback boring was down to 4,515 feet.

LAYING FOUNDATIONS.

The foundation of a building, says Sir J. Gowans, is of primary importance, as, unless it is secure, the permanency of the structure cannot be maintained, however well built it may be. Before laying a stone, the architect or engineer should be satisfied that the strata will give equal resistance to the pressure that may be put upon it. Strata that are hard and soft are very dangerous. Even clay if mixed with bowlders (which often happens) cannot be depended upon, unless they are removed, and means taken to equalize the ground on which the buildings are to be erected. Next to rock, no better foundation can be got than sand or gravel when dry, if wet means should be taken to drain away the water; but, if this cannot be done, large flat bedded foundation stones of sufficient area, fairly dressed in beds and joints and well put together, will, as the load increases, secure a foundation that anything can be built upon. In my own experience I have often tested this, and particularly when building a bridge on a railway contract I had many years ago. This was an under bridge of considerable span, the girders being in the form of an arch, in segments of cast iron, the security of which depended greatly on the permanent resistance of the abutments, or the bolts which held these segments together at their joints. In digging for a foundation it was found that the strata were very soft, being layers of sand and moss alternately, and to prevent failure I took the precaution to strengthen the foundation of the first abutment by driving piles to a depth of 30 to 40 feet, with horizontal planking, on which the foundation stones were bedded. Before building the second abutment, acting on the advice of a railway contractor who had had more experience than myself, I adopted a different plan—viz., to dig out the soft material to such a depth and area as secured an outward resistance to meet the pressure of the large-sized stones that were afterward put into the foundation, course after course, until the load pressed out the water, and so secured a foundation which was equally as strong, if not stronger, than the first. Where the stratum is unequal or not to be depended upon, I know of nothing better than a good bed of concrete, certainly not less than three feet thick, and no architect should neglect this where there is the slightest doubt as to the sustaining character of the ground. This is always necessary in erections of different hights, and is particularly required in churches and other buildings where the spire, tower or other elevation bears more heavily on the foundation than the walls which abut upon them. And, in addition to this, and to make sure, I would have extra courses in the foundation of the higher and heavier portions, as in the hurry with which we build nowadays every precaution is necessary. The same care should be taken with respect to oriel windows or projections, which do not go to the full hight of the building, and consequently have not the same pressure on the foundation. The walls, to which these lighter projections are attached, should not only be well founded, but the tie or bond which unites the one wall to the other should be left free on the upper beds, so as to allow for the subsidence of the heavier wall without causing the fractures so often seen where this precaution is not taken.—[Carpentry & Building.

Crude Oil for Fuel in St. Louis.

The St. Louis Shovel Company have just introduced oil furnaces and are rapidly substituting them for coal furnaces, so that in ten days, or less, no other fuel will be used at their extensive works. The test is the first ever made in St. Louis, and has met with the support of the Standard Oil Company, who propose to build a pipe line from St. Louis to Huntington, Ind., and there connect with their main Western line, provided enough St. Louis manufacturers can be induced to use the oil. The use of oil for fuel for manufacturing purposes is no longer an experiment, and the only question to be decided as regards St. Louis is that of cost. The oil is supplied the St. Louis Shovel Company in tank cars, two of which will be kept side-tracked near the company's works, from which the oil will be pumped into the storage tanks, and then into the supply tank. From the latter it is conveyed by pipes into a cylinder, where the air and oil are mixed. This mixture is emptied in spray form from the cylinders by the atomizers into the furnace chambers, where the flames rage at an intense heat. In fact, from this time on, the lighting of the gas and the regulating of the heat is done by valves, on the same principle that a vapor stove is operated. It is claimed for the oil that it is the cheapest fuel for manufacturing purposes known. It costs delivered in St. Louis 1⅞ cents per gallon, and it is asserted that 120 gallons produces as much heat as a ton of anthracite coal, besides a saving of 20 or 25 per cent. in the cost of handling. In other words, the cost of oil is only one-third of the cost of hard coal.

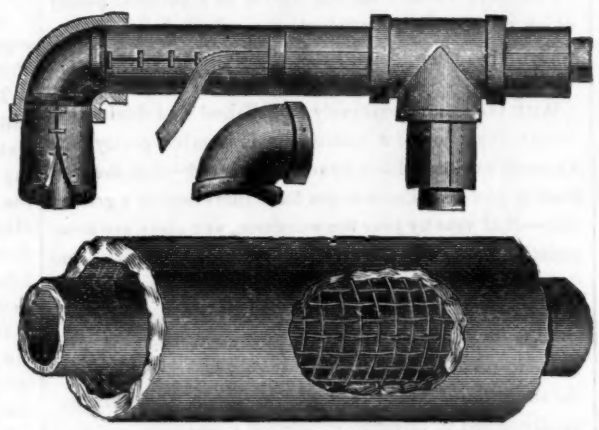
The test is being watched with great interest by manufacturers, and there are doubtless others who would gladly avail themselves of it, provided it is as economical as is claimed for it.

COVERING STEAM PIPES AND BOILERS.

Using steam pipes without covering them with a non-conductor of heat, is like pumping water into a trough with holes in it; you must pump more water than is actually needed, or cover the pipes to prevent radiation of heat, and consequently condensation, and preserve the temperature of the steam, which is its vitality and strength.

Heat is the power that creates the expansive force of steam, and the loss of heat from steam pipes represents the loss of an actual amount of energy, an increased consumption of fuel, and an increased cost of running the steam system, besides the unnecessary wear and tear and racking pipes, drums and boilers by sudden expansion and contraction, cost of repairs resulting therefrom and heating of buildings, adding to their unsanitary condition. Less than 15 per cent. in our best machines, of the original power, is converted into work, and the loss directly and indirectly resulting from radiation, is responsible for much of this loss.

To illustrate the enormous waste, "Thomas Box," in his practical treatise on "Heat," shows that the loss from an uncovered steam pipe 4 inches inside diameter, 100 feet in length, with an initial pressure of 35 pounds, would be 587 heat units per running foot, per hour, or



almost a horse-power per hour. Assuming the cost of coal to be $4.00 per ton, and taking the results of experiments by practical authorities, we find that the yearly waste, from radiation alone, from an uncovered steam pipe 6 inches in diameter, and 100 feet in length, to be $117.90, while the cost of covering the same would not be over $50, and would last a dozen years.

Jno. A. McConnell & Co., 69 Water street, Pittsburgh, Pa., manufacture extensively all kinds of pipe and boiler coverings and asbestos goods. The following are some of their grades: Asbestos cement for plastering direct on the pipes, or on wire netting to form air space. Asbestos fibre and wool felt combination covering. Mineral wool and wool felt combination covering. Hair and asbestos lined coverings of every description. But their specialty is the celebrated Reed's sectional covering, shown in the upper one of the two above illustrations, of which there is more than 1,200 miles in use. Messrs. McConnell & Co. are an old established firm, having been many years in the business, and from their reputation, we believe that any of our patrons, needing anything in the covering heat, insulating or fire-proofing line, will do well to write them. See their adv. on page 712.

Dissatisfied Immigrants.

THOSE immigrants from Europe who return to their old homes are rarely satisfied. Life in this country, with its larger opportunities for improvement and enjoyment, is so much superior that it overbalances the possible cheapness with which the bare necessaries of existence can be purchased in foreign lands. The immigrant accustomed to our modes of life cannot restrict himself to the close penuriousness in which his earlier years were spent. If he tries to live as well as he lived in this country, he usually finds that it costs as much and sometimes more.

SOME LEVEL HEADS IN ENGLAND.

While there is a considerable element among the population of the United States, anxious to change the governmental policy under which the United States have attained their wonderful degree of prosperity, there are impartial witnesses abroad willing to testify their admiration for our national system. Here is what the London *Morning Post* said on the subject on the 22d ult.: "Some figures relating to the economic and industrial progress of the United States in recent years, have lately been made public on the other side of the Atlantic, and well deserve notice in this country, for they form a rather startling commentary on the favorite text of the radical free trader about protection only injuring the country that adopts it. According to our friends of the Cobden school, American commerce and American manufacturers ought to be declining rapidly under the 'withering influence' of a protective tariff. Instead of this, the statistics to which we refer show that in twenty years the population of the States has increased by 69 per cent., the hay crop has increased 106 per cent., the cotton crop 194 per cent., and the production of pig iron over 386 per cent. Railway construction to the extent of 21,000 miles was projected last year, and over 15,000 miles of it were actually constructed in the twelve months. What this means will be better understood when it is pointed out that the total mileage of railroads existing in the United Kingdom last year was under the 21,000 planned as a single season's addition to the tracks in the United States. New rails were required for nearly 20,000 miles of road, and upward of 3,000,000 tons of steel rails were turned out for the new lines in course of construction. This quantity is three times the entire turnout of rails of all descriptions, iron and steel, of all the mills in the United States in the year 1880. Emigration last year was on an exceptionally large scale. On one day the number landed at Castle Garden depot exceeded 11,000—the highest figure ever recorded in the annuals of the New York Immigration Bureau. In fact, the stream of new arrivals poured in so densely as to tax to the utmost the resources both of the numerous Atlantic steamship lines and the immigration authorities of the Eastern ports. Many of the lines were obliged to order their agents to cease booking 'steerage' for a time. A feature too, of last year's immigration was the unusual number of mechanics, bricklayers, plasterers and masons from Scotland, Wales, and the north of England, who went out to the States in response to advices from the other side, stating that there were good openings there for such handicraftsmen. And yet there are scores of politicians here so blind to what is going on in the world as to stick to the old fetich formula that protection is more injurious to the country that adopts it than to the country against which the hostile tariffs are aimed.—[Industrial World.

The Black Swamp Has Experienced a Great Change.

The Wood County *Sentinel* says: 'Wood County is likely to carry off first honors in agricultural display at the Columbus Centennial. Yet, it is scarcely two decades since the very ground where much of this fine produce was grown (Jackson and Liberty townships) was an impassable swamp, the most desolate, uninviting portion of Ohio. To-day it is the chosen garden spot of the State. The enterprise and stamina of the people who have wrought this marvelous change, is the proudest heritage that will be left to successive generations."

Only those who saw that section of country before it was reclaimed—when the headwaters of the Portage River had no channel above the road running from Bowling Green to Findlay, and when the water spread all over that country as far Southwestward as to Deshler—can form the least conception of its repulsive character. It could scarcely be traversed by man or beast, except in the Winter season when frozen. Some of it was prairie and the balance of it was covered with a forest which was so dense that it appeared as though a tree could not find room to fall after it was cut. The first step was the construction of a channel for the Portage. An immense ditch, twelve miles in length, was dug, at a cost of about $80,000 to the property owners. Other ditches followed, and to-day, when crops are growing, the visitor will be richly rewarded by seeing the finest soil and the most thrifty crops that eye ever beheld. It seems a pity to disturb such soil in search for gas or oil. The wealth on the surface should be sufficient to satisfy the most avaracious. There is no county in the State, or in the country that can make Wood County take a back seat.

THE
IRON TRADE REVIEW

A JOURNAL OF THE
IRON AND STEEL INDUSTRY, THE MACHINERY TRADE AND KINDRED INTERESTS.

PUBLISHED EVERY THURSDAY BY THE
CLEVELAND PRINTING AND PUBLISHING CO
Corner St. Clair and Wood Streets, Cleveland, O.

W. M. DAY, Pres't. F. J. STARAL, Sec'y & Treas.
A. WINTEMBERG, Sup't.

W. M. DAY, Editor.
FELIX ROSENBERG, Associate Editor.
E. C. PECHIN, M. E., Special Contributor.
R. S. EVANS, Special Western Representative

Articles written by Mr. Pechin will be signed with his initial, nd only for articles so signed will he be responsible.

INDUSTRIAL ITEMS always welcome.
COMMUNICATIONS from practical men cordially solicited.
IN WRITING to our advertisers, please state that you saw their advertisement in this journal.

TERMS: (strictly in advance):

One year	$3 00
Six months	1 50
Three months	75

Advertising Rates Furnished on Application.

ENTERED AT THE POST OFFICE AT CLEVELAND, O., AS SECOND CLASS MATTER.

CLEVELAND, O., OCTOBER 11, 1888.

AMERICAN WORKMEN AND THE RAINY DAY.

That the average American workingman lives on more and better food, has a more comfortable home, dresses in better clothes, and generally enjoys life more than any other workman under the sun, is so thoroughly acknowledged, as not to require argument. Even the Revenue Reformers admit this while asserting with strange inconsistancy, that he is uniformly robbed by excessive and unjust and illegal taxation which fills the pockets of his employer at his expense.

If these bald facts were submitted to the "man from the moon" just arrived here, and ignorant of the financial and economic policies governing different sections of the earth, he might naturally come to the conclusion that the American workman was an improvident fellow living faster and having a better time than the workman elsewhere, because he was spending all he made while the other was saving in his habits, and curtailing present enjoyment to provide for future emergencies in other words, putting by for the rainy day. But supposing it be shown to the "man from the moon"—that wages paid to foreign workmen were so small that they only afforded a precarious existence to the earner, that he could live only in a wretched house which he did not own—could only buy the simplest articles of food and clothing—that his wife and children must toil with him for a mere pittance, so that the bodies and souls of all of them could be kept together, and that the present brought no enjoyment and the future no hope, that on the contrary the American workingman fed well dressed well, supported his family by his own efforts sent his children to school, in innumerable cases owned his own home, and was one of the vast army that had laid by from earnings and drawing interest, a sum in the aggregate, so prodigious, as to be almost incomprehensible—would not the "man from the moon" want to know what causes had been at work to produce a contrast so wonderful, and so far as one side was concerned, so fearful? We propose to submit some surprising figures as to what the American people have done for the rainy day, and our authority is the tenth number of the Statistical Abstract of the United States, prepared under the direction of the Secretary of the Treasury. In the year 1887 there was on deposit in the Savings Banks of the United States, the gigantic sum of one billion, two hundred and thirty-five milllions, seven hundred and thirty-six thousand dollars. Possibly the magnitude of this sum may be faintly apprehended, by comparison with the capital of the entire National Banking system of the country, which for the same year was $578,000,000, or only 46 per cent. The significant fact remains to be stated—that of this enormous sum, over eleven hundred millions are credited to the New England States, New York, New Jersey and Pennsylvania, the great manufacturing States of the Union. Ohio and Illinois, combining agriculture and manufactures, show thirty millions. Excluding Maryland and Delaware, with twenty-one millions, but one Southern State shows any deposits. North Carolina has eleven thousand dollars.

Capitalists and manufacturers don't deposit in Savings Banks, as they want more than 4 per cent. for their money, hence the assumption is a fair one that the deposits are those of persons of moderate means, and all people of moderate means, are working men and women.

But the above sum, gigantic as it is, does not, by any means, represent the money saved by the working classes. The great manufacturing States of Pennsylvania and Ohio show deposits of only 42 millions and 15 millions, respectively. We must look for the savings of workmen in these States in another direction.

In no other States has the Building & Loan Association met with so large a development and so abundant a success.

In the City of Philadelphia, it is authoritatively stated that 170,000 houses are owned by the people who live in them. One may travel for miles and miles, past tens of thousands of snug, comfortable brick houses, inhabited by workingmen, and built through the instrumentality of Building Associations—so also in Pittsburgh, Allegheny and inland towns. Cincinnati has taken an active part in organizing these valuable Associations. It is scarcely possible to estimate the value of the real estate holdings of workingmen, paid for out of the savings from the wages paid in Protected America. Can any parallel be shown in Free Trade England?

Can there be any radical defect in a national policy which produces such satisfactory results?

Can the vine bring forth thorns or the fig tree thistle?

With the facts positively established that during the twenty-five years of a continuous Protective policy, the wages of workmen have steadily increased—that the purchasing power of those wages have increased in a greater ratio—that year by year the workmen, as a class, are accumulating enormous reserves in cash and real estate, and that their general condition is infinitely more comfortable and prosperous than that of their class anywhere else—is it good sense, or is it ordinary business prudence to take any step, whether short or long, towards the adoption of a contrary policy, which elsewhere has wholly failed to bring about similar conditions.

E. C. P.

END OF THE BASIC STEEL LITIGATION.

We greatly regret that the decision of the Supreme Court has been adverse to Mr. Jacob Reese. It would seem now that the Basic process is unavailable in this country until the expiration of the patents, unless the Bessemer Pool see fit to grant licenses. For the time it takes away from the South the opportunity to make steel, from their abundant and cheap high phosphorus ores, unless the Pratt process for dephosphorization proves successful. Of this, we cannot express an opinion, as all efforts to obtain a description of the process have hitherto failed. The Henderson process at Birmingham is said to be a theoretical success, but whether it is so commercially remains to be shown.

Mr Justice Green, in an opinion delivered in the State Supreme Court in Pittsburgh, on Monday, dismissed the appeal of Jacob Reese, in the suit of the Bessemer Steel Company against him to require him to deliver up certain patents for the basic process of manufacturing steel, at the costs of Mr. Reese.

The Court says: "The chief contention of the parties to this litigation is upon the terms of their contract relation. That relation is evidenced by four distinct writings. The Court below held that all the inventions relating to the manufacture of iron or steel into rails, ingots or billets, metallurgy of iron or steel were included. Mr. Reese contended that the Court erred in holding that any inventions not patented or applied for at the date of the contract were included in its operation.

"We are clear," said Justice Green, "that when Mr. Reese stipulated in his letters that he would sell or assign the exclusive right to use all and every patent either granted or applied for, together with all renewals, reissues or improvements of the same which can be used or relate or apply in any way to the Bessemer or pneumatic process in the United States, he undertook to transfer whatever inventions he had then made relating to the Bessemer or pneumatic process, whether he had at that time obtained patents therefor or applied for them or not. It seems to us that good faith requires this interpretation, otherwise he could hold back important inventions, which, in point of fact, were improvements upon patents then issued or for which applications were then made, and by incorporating them into subsequent patents or applications use them to the injury of the Bessemer Company. We are of the opinion that the case was rightly decided by the Court below."—American Manufacturer.

THE NEW VIADUCT.

The practical completion of the new viaduct connecting the North and South sides is another evidence of the enterprise of Cleveland, and results will, unquestionably, show that objections to it were unfounded. The rapid extension and development of the South Side made it imperative that it should be brought into quick and easy connection with the business centre of the city. The tendency will be to make Erie street a new business avenue, and to supplant the small stores now on it with more pretentious buildings. The Y. M. C. A., in securing the splendid lot at the corner of Erie and Prospect streets, have taken time by the fore-lock and made an investment that will steadily and rapidly increase in value.

MEETING OF BOARD OF INDUSTRY.

A joint meeting of Citizens and the Board of Industry was held on Saturday, Oct. 6, 1888, at 3 P. M.

Gen. Barnett was called to the chair. Letters of regret for non-attendance, were read from Messrs. C. H. Pritchard, Mr. A. Madison and Dr. H. K Cushing.

The petition of leading citizens asking the Board to call a general meeting for discussing the questions of water supply and sewerage system was read. The meeting was then thrown open for remarks generally, and the following gentlemen spoke: Dr. G. C. Ashmun, Health Officer, Prof. Smith, Prof. Staley, Engineer Rice, Mr. Whitelaw, Engineer of the Water Works, Mr. Lyon, Mr. Force, Dr. Beckwith, Hon. J. A. Foot, and Prof. Maberry.

Dr. Ashmun spoke of the inadvisability of cutting off the sewer privileges of the Standard Oil Co. and similar concerns, by stopping the use of the river before providing new sewerage.

The following preamble and resolution were then adopted:

Whereas: It appears by the testimony of practical an experienced gentlemen who have closely studied the subject, that danger to the health of our citizens lies in the fact that our present sewer system is incomplete, and our water supply is thereby affected; therefore, resolved: That we recognize and approve the preliminary work already undertaken by our municipal boards and committees, and we hereby pledge them our hearty co-operation in all their efforts to remedy this state of affairs, and we believe the tax-payers of Cleveland will cheerfully approve of any wise and economical plan necessary to accomplish this important result.

Resolved: That the Chairman is hereby requested to appoint a committee of five to have this matter in charge, said committee to take such action as in their judgement is best calculated to accomplish the above result; reporting from time to time to the Board of Industry as to progress made, until the desired end is reached.

A committee was appointed consisting of Messrs. P. M. Hitchcock, S. A. Fuller, L. E. Holden, J. H. McBride and H. D. Coffenberry.

Meeting of the Mechanical Engineers.

The Ninth Annual Meeting of the Mechanical Engineers will be held at Scranton, Pa., Monday evening, October 19th. The Secretary's office and headquarters will be at the Westminster Hotel. A large number of papers to be read are announced, and the meeting promises to be of unusual interest.

THE highest stations in Europe for making meteorological observations, are about 10,000 and 11,000 feet above sea level. That on Pike's Peak is 14,100 feet. thus exceeding, by more than 3,000 feet any in Europe But that is not the highest in America, for on Mount Lincoln, in Colorada, there are mining works at an elevation of 14,297 feet, and at the same point a meteorological station conducted by Harvard College. In Peru there is a station on the Andes 14,300 feet above the sea.

THE MASSICK & CROOKE'S FIRE BRICK STOVES.

Nothing has contributed more largely to the increased efficiency of blast furnace work than the substitution of fire brick for cast iron stoves. The two prevailing types have been the Cowper and Whitwell. In themselves a great advance over former stoves, they have nevertheless been largely improved by American engineers. Good as they have been and are, experience has shown weak points which engineering ability has been steadily working to remedy.

A new competitor, as far as the United States is concerned, is in the field, uniting the good qualities of the old, with very decided improvements in several essential points. This is the Massick & Crooke's stove represented by Messrs. McClure & Schuler, of Pittsburgh, Pa. For simplicity, economy, efficiency and durability, these stoves stand in the front rank. Although comparatively new in this country, scores of them are in successful operation in Great Britain.

The accompanying plates show the construction and general arrangement of the three pass stove. The shell is the ordinary wrought iron cylinder, with a conical shaped top. Each stove has its own draft stack, thus doing away with the necessity of expensive under-ground flues and lofty chimney stack. In the centre is a large combustion chamber, into which the gases are admitted at the bottom, thence passing upward and down through a series of large segmental shaped flues, and upward through smaller flues to the escape at the top. The mushroom chimney valve, down when the gases are burning, and up, when the blast is on, is one of the most perfect valves in construction and operation that can be devised. It works automatically: the pressure of the blast when on closes it, and when the pressure is relieved it opens, being counterbalanced as shown. From the lever a wire is attached, which reaches to the ground, so that the valve can be held closed to retain the heat, during any temporary stoppage of the furnace. A door is provided in the stack, so that ready access can be had to this valve, either for cleaning or replacement, if this should become necessary. When the valve is closed by the incoming blast, the volume of air impinges upon the under side, breaking its force before reaching the brick work, thus preventing the cutting of the brick, as takes place in some stoves of other types. Both this and the cold blast valve are readily regulated from the ground.

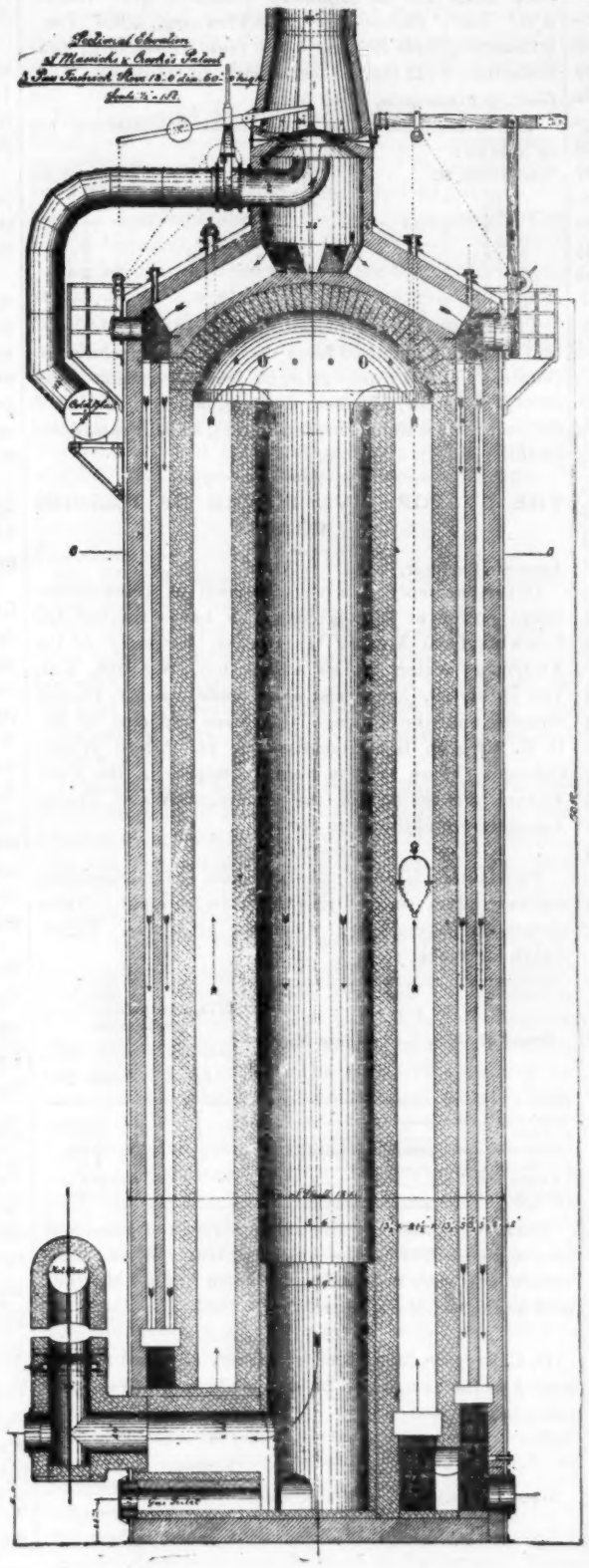
One very great advantage in this stove, especially in localities where there is a scant supply of water, is that it has but one water valve—the hot blast valve. This valve is of solid cast iron. Water is only used in the stem and seat ring. The valve and stem being two separate pieces connected together by a pin or bolt fitting loosely in the holes, finds its bearing on the seat, should the seat in any way be out of level. From the manner of construction and arrangement, the valve and seat can be readily replaced in a very short time and at small cost.

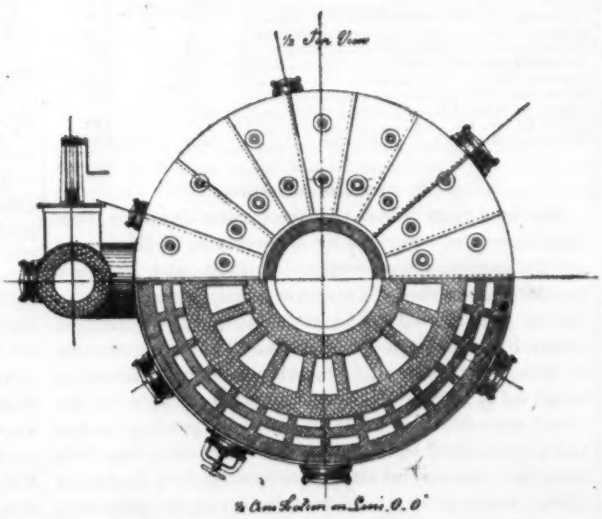
No matter how well a fire brick stove is constructed one of the weak points is in the brick work of the combustion chamber. This is eaten away by the intense heat, and at times must be repaired or rebuilt. A false wall 4½″ thick is carried up for a distance from the bottom, against the main wall, where this action is most intense. By an admirable device of Messrs. McClure & Schuler, the main walls of the combustion chamber in the Massick & Crooke, are built independent of the cross walls, so that at any time an entirely new wall can be put in without disturbing a brick in the connecting walls.

On the stove on the outside of these flues, there is an ingenious arrangement of fly back relief doors, which suddenly opened, when the blast is on, causes a rapid movement of the air in the direction of the opening. The mechanical cleaning is a quick, easy and thorough job. Caps are taken off from the 2½″ pipes on top, through which pipes, a chain is dropped connecting at the bottom with an open steel scraper, fitting the opening. This is drawn to the top by the portable crane shown, and back again, completely freeing the walls of all adhering dust. There can be no possible question of the absolute efficiency of this method of cleaning.

The strong points in these stoves are moderate first cost. Minimum of water valves, always a source of trouble and cost. Thickness of walls storing up the heat. The proper burning of the gases throughout the stove. Ease in making repairs to brick work. The best possible method for keeping the walls clean.

The writer has carefully examined and watched the workings of the stoves at Messrs. Shoenberger, Speers & Co., at Pittsburgh, the first erected in this country. Other than blowing off through the relief doors and clearing out the bottom flues, the stoves have not been cleaned since the "blowing in" some eleven months since. The heats were steady at 1,350° to 1,400°, and the owner stated that there was no trouble in running them up to 1,700°. In the outside flues there was bright red glow, showing that all of the brick work was being fully utilized. The value of thick walls in retaining the heat was shown by a starting off temperature of 1,200° after an eight hours stop.





MASSICK & CROOKE'S FIRE BRICK STOVES.

This examination was made the latter part of September. On October 1st one of the stoves was opened to test the mechanical cleaning arrangement which was found to work admirably. There had been a slight wear on the false 4½″ wall but otherwise the brick work was as good as when the stove was started eleven months since. The excellent work done by these stoves is attracting much attention among furnacemen, and they have been adopted by the Williamson Furnace Co., of Birmingham, Ala.; the Brier Hill Coal & Iron Co., of Youngstown, O.; and Mr. E. C. Potter, of the North Chicago Rolling Mill Co. Careful study and long experience has made Mr. Potter a most competent judge, and his adoption after long and thorough personal investigation, is the highest possible endorsement of the merits of the Massick & Crooke's stove. E. C. P.

LAKE SUPERIOR IRON NOTES.

Special Correspondence to the IRON TRADE REVIEW.

FLORENCE, Wis., October 8.—The lake shipments of ore at the close of the past shipping week aggregated 3,510,864 tons, or within 285,019 tons of the quantity that had been shipped from the Lake Superior district one year ago. The shipments by ranges are as follows: Marquette, 1,376,157 tons; Gogebic, 1,003,386 tons; Menominee, 833,088 tons; Vermilion, 298,223 tons. The local and all-rail shipments bring the total product up to over 3,600,000 tons, leaving less than 400,000 tons to be shipped between October 3 and December 31 to bring the season's output from this district to 4,000,000 tons of ore. There is little doubt, however, that the season's product will considerably exceed the latter estimate, as the mines are now shipping over 150,000 tons each week, and eight weeks yet remain before the close of navigation. Mine owners feel very much encouraged over the results of the year just drawing to a close, which is one of the best ever experienced in the Lake Superior district. While there has been no boom whatever, a good, healthy demand for Bessemer and non-Bessemer ore has existed since early in the Summer. It is believed here that the demand will continue to increase for many months to come, and the outlook for the mining interests is decidedly bright. Most of the mines in this region are already preparing to mine a much larger quantity of ore during the coming Winter than was done during the Winter of 1887–88. A new level will be opened up at the Florence mine, Nos. 4 and 5 shafts are to be sunk 50 feet deeper, and it is expected that next Spring's stock-pile will contain in the neighborhood of 60,000 tons of ore. The season's product of this mine will reach, at least, 135,000 tons, and perhaps but for the disastrous fire at the mine in July last and the scarcity of cars and men, the output would certainly have aggregated 160,000 tons. As it is, the output this year will be double that of 1887. The Iron River mine will ship 90,000 tons this year, No. 3 shaft will be sunk 80 feet deeper next Winter, and the property will easily put out 125,000 tons during another year. The Chapin mine is shipping at the rate of 9,000 to 10,000 tons each week, and the total shipments are within about 60,000 tons of the amount sent out at the corresponding date last year If the conditions continue favorable, it is quite likely that the Youngstown mine, at Crystal Falls, will be wrought next season.

Aluminum.

Krupp's motive in taking up the manufacture of aluminum, according to the system of Professor Netto, of Dresden, who, in his process, uses cryolith, a mineral product found in Greenland, and in the Ural Mountains, is said to be to use the metal as an alloy for steel, an admixture of 1.10 per cent. being sufficient. This method is said to have an advantage over the electric process introduced by Cowles Brothers, in that it yields chemically pure aluminum at the comparatively low cost of 12 marks a kilo, and can produce an ingot of 2½ kilos. in about an hour's time.

AN English company will develop Battle Mountain (Nev.) copper mines.

OUR ECONOMIC GROWTH AND ITS CAUSES.

The movements of commerce, the development of private and public wealth, and the progress of modern nations in productive power, have always been favorite topics at the annual conventions of the British Association. At their recent meeting at Bath, a well-known watering place in the South of England, an interesting comparison was presented as to the United States by Mr. Michael G. Mulhall, whose researches in economic statistics are always valuable and practical, and his suggestions often original and profound. In his brief address he has given an analysis of the elementary productive powers of the four chief industrial nations of Christendom, and the results are presented in the following table showing the wealth-creating energy at work every day in each country, expressed in millions of foot-tons:

INDUSTRIAL WORKING POWER 1888.

In millions of foot-tons daily.

	Hand.	Steam.	Horse.	Total.
United States	8,454	48,400	33,600	89,454
Great Britain	5, 90	38,980	8,700	52,950
France	5,690	16,150	8,500	30,340
Germany	6,930	19,800	10,500	37,230

On this analysis we may infer that 60 per cent. of the productive energy utilized for the creation of wealth in modern nations is generated by steam power; 28 per cent. by horse power, and only 12 per cent. by manual labor. Comparing the several aggregates we find that the productive forces of the United States, measured by foot-tons daily, equal those of France and Great Britain together and are two and a half times as great as the productive forces of Germany.

Of course we possess besides these facts other evidence that our own country has abundant means of growing in wealth more rapidly than European nations, but to complete our record there are large classes of economic forces to be considered; and many hostile influences must also be taken into the account before we can arrive at a trustworthy analysis of the forces which control and limit our national progress.

We may safely conclude, however, with Mr. Mulhall and a host of other competent economists in Europe and in the United States that the economic horizon on every side is full of bright omens. "At present the increase of industry, energy and wealth goes on unabated. The next census in 1890 will probably aggregate energy of 100,000 foot-tons daily, and an accumulated wealth of 14,000 millions sterling, figures never before applicable to any nation in the world." This inspiring prediction of Mr. Mulhall for the United States, is susceptible of a long diversified series of proofs and illustrations, from our more perfect system of banking machinery, of railroad travel, of telegraphic communications, and of other modern facilities for economizing our energies and capital, and for making our industrial mechanism more efficient in the development of material progress and in the creation of productive wealth.—[American Banker.

The New Forth Bridge.

The new railroad bridge over the Frith of Forth, in Scotland, to replace the one which went down with such appalling results a few years ago, is now near completion, and is described as one of the finest pieces of engineering in the world. The chief engineer of the structure gives the following "cold facts" regarding it: The total length of the viaduct will be 8,296 feet, or nearly 1⅝ miles, and there are two spans 1,710 feet, two of 680 feet, fifteen of 168 feet girders, four of 57 feet, and three of 25 feet, being masonry arches. The clear headway for navigation will not be less than 150 feet for 500 feet in the center of the 1,710 feet spans. The extreme height of the structure is 361 feet above, and the extreme depths of foundations 91 feet below the level of high water. There will be about 53,000 tons of steel in the superstructure of the viaduct, and the material used throughout is open-hearth or Siemens-Martin steel. That used for parts subject to tension is specified to withstand a tensile stress of 30 to 33 tons to the square inch with an elongation in eight inches of not less than 20 per cent.; that subject to compression only a tensile stress of 34 to 37 tons per square inch, with an elongation in eight inches of not less than 17 per cent.—[Exchange.

The Deepest Bored Well in the World.

The deepest bore-hole in the world is at Schladebach, near Kotschau station, on the railway between Corbetha and Leipsic, and has been undertaken by the Prussian government in search of coal. The apparatus used is a diamond drill, down the hollow shaft of which water is forced, rising again to the surface outside the shaft of the drill, and inside the tube in which the drill works. By this method cores of about fifty feet in length have been obtained. The average length bored in 24 hours is from 20 to 33 feet, but under favorable circumstances as much as 180 feet has been bored in that time. Other deep holes are as follows: Domnitz, near Wettin, 3,287 feet; Probot-Jesar, Mecklenburg, 3,907 feet; Sperenberg, near Zossen, 4,173 feet; Unsenburg, near Strassfurt, 4 242 feet; Lieth-Elmshorn, Holstein, 4,390 feet; Schladebach, 4,515 feet.

The dimensions of the bore-hole at Schladebach are as follows:

Total depth, ft.	Depth, ft.	Diameter, in.
189.6	186 6	11 0
605 7	416 1	9 0
661.8	56.1	7 3
1996 5	1214 7	4.7
2259.8	353 3	3 6
3 43 4	1283 6	2 8
4069 9	5.6.5	1 97
4514.6	444.7	1.88

The various strata passed through are as follows: Soil and sand, about 16 feet; clay, 66 feet; sandstone (bunter) 459 feet; anhydrite, 59 feet; magnesian limestone, (zechstein) 144 feet; gypsum, 36 feet; anhydrite, 295 feet; Marl slate (Kupfersheifer), 3 feet; sandstone, (rothliegendes), 3 435 feet.

THE EVAPORATIVE POWER OF ILLINOIS COALS.

American Engineer.

In further reply to a correspondent as to the evaporative power of Illinois coals, we have received the following from Mr. J. H. Decker, Secretary of the American Water Works Association, Winfield, Kas. The Hannibal, Mo., tests were made by Mr. Decker himself, and the Chicago tests were reported by Mr. D. C. Cregier, late Commissioner of Public Works, Chicago. These reports were contained in the Fifth Annual proceedings of the American Water Works Association, published in 1885:

HANNIBAL, MO.

Two boilers 60″x16′, 84—3″ tubes, set independent, ordinary plain setting, single return draught. Grate surface 25 square feet. Common grate bar. Three-eighth air space.

Brand of Coal, i. e., Where Mined.	Evaporation lbs. Water per lb Coal.	
	Actual.	rom 212°.
Neelyville, Ill	7.179	8.509
Athens, Ill	6.49	7.8
Colchester and Springfield, Ill	5.80	6 46
Colchester, Ill	6.13	7 50
Lawson, Ill	5 17	6 25
Rich Hill, Mo	6.5 4	8.56

NOTE.—The above is the average result of a series of tests made in 1884 for the American Water Works Association, and were reported at the Fifth Annual Meeting, held at Boston, Mass., April 21–23, 1885.

CHICAGO, ILL.

D. C. Cregier, late Chief Engineer, reported the following as the average of 29 tests made at the West Side pumping station:

Brand of Coal, i. e., Where Mined.	Evaporation lbs Water per lb. Coal.	
	Actual.	From 212°.
Vermillion, Ill	5.97	5.68
Minonk, Ill	6.71	7.50
Grape Creek Ill	6.82	7.33
Wilmington and Springfield, Ill	6 96	7.38
Streator, Ill	7 16	7.59
Wilmington, Streator, Ill	7.24	7.67
Briar Ridge, Nur, Ill	7 33	7.77
Seneca, Ill	7.36	7.80
Shawnee, Ill	7.44	8.32
Streator, Nur, Ill	8.09	
Briar Ridge, Ill	8.16	8 65
Shawnee, Ill	8.18	8.67

A Famous Meteorite.

We learn from *Science* that the famous Bahia or Bendego meteorite, described by Morney and Wollaston in the Philosophical Transactions of 1816, and by Spix and Martine in their "Travels in Brazil," was landed in Rio de Janeiro on June 15, and is now in the collection of the Brazilial National Museum. The transportation of this great mass of iron, which has been found to weigh 5,361 kilogrammes, was rendered possible by the recent completion of a line of railroad passing within 115 kilometres of the Bendego Creek, where it has lain since the unsuccessful attempt to remove it to Bahia in 1785. After about three months spent in preparing material and in studying the route to be traversed, the march began on November 25, 1887, and the meteorite was placed on the railroad on May 14 of the present year.

AMERICAN INSTITUTE OF MINING ENGINEERS.

The 52d meeting at Buffalo, N. Y., on the 2d inst. was as usual, a success. The first session was held on Tuesday evening, at the rooms of the Society of Natural Sciences, Buffalo Library Building.

Dr. Julius Pohlmann, secretary of the Local Committee, made a happy address of welcome, to which Dr. Potter responded. Dr. Potter, president of the Institute, then delivered a carefully prepared paper on the "Needs of the Mining Engineer."

Dr. Raymond read a paper on "A Gold Breast-Plate from Central America," found in mining operations at the Great Remance quartz mine, about 15 miles from Santiago, U. S. of Columbia.

It was of pure gold, weighing about 110 pennyweights, and supposed to be 400 years old. It was supposed to be a token or coat of arms, represented a bat with outstretched wings. The body is the head and neck of a deer, the antlers being in the form of alligators. While the body was cast, the wings of the bat are of beaten gold, welded to the head. The whole workmanship shows great skill.

At the second session, on Wednesday evening, the first paper read was by Capt. F. V. Greene, on the "Uses of Asphalt," an interesting and elaborate paper.

He was followed by Prof. Julius Pohlmann, on "The Life History of Niagara Falls." The last paper of the evening was "Soaping Geysers," by Dr. V. Raymond.

At the last session, on Friday, a paper was read on the "Cultivation of Mushrooms at Akron, N. Y.," by William T. Warren—in the old cement quarries there. Also a long paper upon "Forestry and Mining," by B. E. Fernow, of Washington, D. C.

At all of the meetings of the Institute, many papers are presented which cannot possibly be read. These are, however, read by title, and subsequently appear in the printed proceedings of the Institute. The following papers were read by title:

"The Glenmore Iron Estate, Greenbrier Co., Va." by W. N. Page, Powelton, W Va.

"Anthracite and Coke, Separate and Mixed, in the Warwick Blast Furnace," by Edgar S Cook, Pottstown, Pa.

"Note on a Tuyere Slagging Valve," by Edgar S. Cook, Pottstown, Pa.

"Note on a Speed and Pressure Regulator for Blast Furnace Engines," by Edgar S. Cook Pottstown, Pa.

"Chlorination at the Phœnix Yadkin Gold Mines, North Carolina," by William B Phillips, Chapel Hill, N. C.

"A Differential Hot blast Stove and its Application to an Open-hearth Blast Furnace," by Jacob F. Wainright, Pittsburgh, Pa.

"Note on a Specimen of Gilsonite from Uintah County, Utah," by R. W. Raymond, New York City

"Notes on the Roasting of the Hudson River Carbonate Ores," by Ingers ll Olmstead, Burden, N. Y.

"The Minerals of Ontario and their Development," by W. Hamilton Merritt, Toronto, Canada.

"Note on a Cast Steel Water Jacket," by R. H. Terhune, Salt Lake City, Utah.

"The Flue Dust of the Furnaces at Low Moor," by Ellison C. Means, Low Moor, Va.

"Notes on the Rosario Mine, San Suancito, Honduras," by Thomas H. Laggett, Fairplay, Col

"Water Analysis." by A. E. Hunt and George H. Clapp, Pittsburgh, Pa.

"The Handling of Natural Gas," by John F. Wilcox, Pittsburgh, Pa.

"Pig Iron of Unusual Strength," by Fred P. Dewey, Washington, D. C.

"Nickel Ore from Logan County, Kas.," by Fred P. Dewey, Washington, D. C.

"Cement Rock and Gypsum Deposits in Buffalo," by Julius Pohlmann, Buffalo, N. Y.

"Improved Methods of Refining the Oils of the Findlay Field of Ohio," by Prof William H Pitt, of the Buffalo High School.

"The Relation Between the Ore Mixture and the Reduction of Silica in the Blast Furnace," by B. F. Fackenthal, Jr.

"Geology of Buffalo," by Charles A. Ashburner, of Pittsburgh

"The Carbon Theory of Hardening Steel," by H. M. Howe, of Boston.

"The Equalization of Load on Winding Engines by the Employment of Spiral Drums," by E. M. Rogers, of Central City, Col.

"The Northwest Colorado Coal Region," by G. C. Hewett, Glenwood Springs, Col.

"The Effect of Velocity and Tension of Gases on the Reduction of Ore in the Blast Furnaces," by Theodore W. Robinson, of Joliet, Ill.

"Ferro-silicon and the Economy of Its Use," by W. J. Keep and Edward Orton, Jr., of Colorado.

After a vote of thanks to the local committee, the citizens of Buffalo, and the Press, the session adjourned to meet in New York, February, 1889.

EXCURSIONS.

On Wednesday, a special train took the members to Dunkirk, to visit the Brooks Locomotive Works. Dinner was served at the elegant mansion of the Brooks family. Thursday was wet and disagreeable, but excursions were made, by tugs, to the Union Bridge Co.'s works, the grain elevators, the breakwater and water works, then, by train, to the Cement Co.'s works on Main street. On Thursday evening the usual subscription banquet was had at The Niagara.

On Friday, an excursion was made to Lockport, and the Holly Manufacturing Co., and the Cowles Electric Works, and the seven combined locks on the canal inspected. This closed the meeting.

Industrial Notes

Blast Furnaces:—

Top Mill Furnace, Wheeling (W. Va.) Iron & Nail Company, will probably blow in on or about the 15th of October.

The Big Hill Ore & Lumber Co., of Baldwin, Va., are negotiating with Chicago capitalists in regard to the erection of an iron furnace.

The furnace and stoves of the Gadsden, Alabama, furnace, at Gadsden, were fired last week to dry them out, preparatory to blowing in, which will be in a very short time.

Florence Furnace, Henderson Iron Company, Sharpsville, Pa., which blew out on the 19th ult., is undergoing repairs, which will probably be completed by the 1st of November.

Charlotte Furnace, Charlotte Iron Works, Rochester, N. Y., is being repaired for a renewal of operations, which, it is expected, will take place before the close of the current month.

The Bessemer Manganese Mining & Furnace Company, of Little Rock, Ark., organized to build an iron furnace, to cost about $50,000, is asking for bids for construction of the works.

The hoisting towers at the two new furnaces at Anniston, Ala., are completed. These furnaces are seventy-five feet tall, sixteen feet diameter of bosh, 10 feet diameter of hearth, and will be blown with eight seven and a half inch tuyers. The output of these furnaces will be two thousand tons per week, average work.

The blast furnace of the Ashland (Wis.) Iron & Steel Works has gradually increased its capacity every week. Last week was the heaviest of the season. Five hundred and thirty-two tons or 1,064,000 pounds of pig iron were manufactured last week at the furnace. The shipments the past two weeks has cleared up about all of the stock on hand. Several other large orders have been filed during the week, which will require all of the products of the furnace for some time yet to come. Nearly all of the iron is being shipped by rail at present.—[Ashland Press.

The two remaining furnaces of the four recently built by the Tennessee Coal, Iron & Railroad Co., at Ensley City, are almost complete, and will blow in soon. Furnace No. 2 is nearly finished, only a small amount of iron work remaining to be done. It will blow in within the next two weeks. Furnace No. 1 will not commence operations before the latter part of next month. Furnaces No. 3 and 4, which have been working for some time, continue to turn out a good amount of pig iron daily, which is shipped as fast as it is made. The most of this iron goes to New York and Philadelphia by way of the Georgia Central Railroad of Georgia and the Ocean Steamship Company's lines.—[Tradesman.

Rolling Mills:—

The first gas furnace at Kelly's mill, Ironton, O., has been started and works properly. The other furnace is nearly completed.

The Lookout Rolling Mill at Chattanooga, Tenn., is now running iron bars 100 ft. long, and is making arrangements to turn out bars up to 130 ft. in length.

Work on the rolling mill at Bristol, Tenn., is progressing very satisfactorily. Mr. W. C. Lewis, superintendent of the work, has just returned from Pittsburgh, Pa., where he has been looking after machinery. It is confidently expected that it will be in operation by the middle of December or the first of January next.

The new iron works at Duluth, Minn., are to consist of large rolling mills with two trains of rolls—one 18-inch train and one 10-inch train; two foundries—one for making car wheels and the other for general castings; one shop for planing, mortising and otherwise preparing lumber for use in the making of cars; one machine shop in which the heavy axles will be made and the wheels bored.

At the Riverside the plate, bar and skelp mills, pipe and steel works are all running full turns. The factory was on but two days this week, for want of plate. The pipe works are pushed to their fullest capacity to keep the order book clear and then cannot always do it, as the orders at this time of year are largely for immediate shipment. One of that kind for ten car loads had to be turned down last Monday.—Business is of the rushing order at A. J. Sweeney & Son's foundry; the night turn is still continued. Shipped two car loads more of glass works machinery to Pittsburgh this week, making seven in all and leaving eight more to ship on that contract.—[Ohio Valley Manufacturer.

Steel Works:—

Recently No. 2 Bessemer mill, of the Pennsylvania Steel Company, at Steelton, Pa., made an extraordinary run in its average of over 1,000 tons of steel ingots each day.

The Homestead Steel Works, of Pittsburgh, Pa., are doing some extraordinarily good work, in rolling steel plates for the ordnance department. These plates are 148″x112″x2″, and weigh about 10,000 lbs., with 80,000 lbs. tensile strength and 21 per cent. elongation. The carbon runs about .43.

The buildings for the plant of the Latrobe Steel Co., at Latrobe, Pa., for which Witherow's works, New Castle, Pa., have the contract, will be made of wrought iron and will be fire-proof. The dimensions of the open-hearth steel department will be 250x80 feet. The hammer shops will be 350 feet long, with an 80-foot span, and will have an L the same length, and a 40-foot span. The company will manufacture tires for all kinds of wheels. About 300 men will be given employment.—[Guardian.

Foundries:—

The Chase Turbine Company have nearly completed a new foundry at Orange, Mass.

The incorporators of the Globe Foundry at Wellston, Ohio, have purchased the foundry building recently erected by Spellacy Brothers, and will at once equip and start it in operation, to manufacture miners' supplies, such as cars, tools, etc., and make engines, machinery, etc.

It is said that the Erie Railway Company have purchased 75 acres of land at Susquehanna, Pa., and that amongst other buildings they will erect a large foundry. The company will also enlarge their machine shop and other shops, and will employ double the number of men at present employed.

The Ranken & Fritsch Foundry & Machine Company, St. Louis, successors to the Smith, Beggs & Ranken Machine Company, are now prepared for business as manufacturers of Corliss, piston and slide valve engines, steam and hydraulic elevators, general machinery, etc. It is the intention to make the establishment one of the most extensive and complete of its kind west of Pittsburgh.

A very destructive fire occurred at Bellaire, Saturday morning, which destroyed the Ohio Valley foundry, a stock affair. The window glass works, adjoining the foundry, was also damaged to the amount of $15,000. The foundry was insured on building and stock for $22,000, but the greatest loss to the company is their patterns, which were all consumed. Four car loads of soda ash on board the cars of the C. & P. road were also destroyed.—[Ohio Valley News.

Miscellaneous:—

The Chicago Steel Rail Company, of Chicago; capital stock, $200,000; incorporators, Samuel W. Adams, John Good, and William A. Hinkins.

The Cumberland River Iron & Manufacturing Company, of Chicago; capital stock, $1,000,000; incorporators, William A. Gardiner, Frank B. Dyche and Frank F. Reed.

The Minnesota Car Company, of Duluth, Minn., has been organized, with a capital of $400,000. The works will consist of a rolling mill, machine shop, foundry and car works.

The Aluminum Brass & Bronze Company was recently organized at Waterbury, Conn., for the manufacture of bronze from aluminum and other alloys. Mr. Charles S. Morse will be the General Superintendent. The supply of aluminum will be supplied from Cowles furnaces at Lockport.

Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 o'clock P. M., on the 19th day of October, 1888, for the workmanship and material required for certain cornice gutter linings, and connections of the U. S. Court House, Post Office, etc., building, at Louisville, Ky.

The yearly output of Howe, Brown & Co., steel manufacturers, Pittsburgh, Pa., is 14,000 tons, about one-fourth of which quantity is of the finer steels used in the manufacture of axes, mowing machine knives and small tools. This firm put on the market a year or so ago, a brand of too steel, called "Cameron Self-Hardening Steel," which we have heard highly commended by prominent American mechanics who have used it, as being in every way equal to the imported mushet.

W. A. Pierce, the master mechanic of the Cheney Bros. factories at South Manchester, Conn., is the inventor of a wonderful device that is calculated to lighten, to a considerable degree, the work of stationary engineers. It is placed upon the supply pipe of a boiler and by its operation automatically controls the admission of feed water.—[Amer. Eng.

Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 o'clock P. M., on the 16th day of October, 1888, for the labor and materials required in the erection and completion of the Low-Pressure Return Circulation Steam Heating and Ventilating Apparatus for the U. S. Court House and Post Office building, at Des Moines, Iowa.

The Beckett Foundry & Machine Company, Arlington, N. J., have succeeded the Beckett & McDowell Mfg. Co. The works, both foundry and machine shop, have been increased, and new tools added, so as to double their former capacity. The company now have facilities for handling the heaviest kind of work, and in addition to the regular lines of work, are prepared for doing anything offered in the foundry and machine shop line. They expect soon to begin the manufacture of Corliss engines.

The old ruins of the Perry Stove Works, at South Pittsburgh, Tenn., have been cleared away. The machinery is undergoing most thorough repairs, and the specifications and plans of the new brick factory are in the hands of contractors who are submitting their bids. The buildings will be three in number; each and all of brick. Building No. 1 is 250 feet long, and forty-six feet wide, two stories high; building No. 2 is 150 feet long by fifty feet wide, two stories high; building No. 3 is thirty-seven by fifty feet, one story. The probable cost of these buildings will be between $25,000 and $30,000. The material for roofing is not yet decided upon, but will be tar and gravel or tin.—[Tradesman.

The Tennessee Coal, Iron & Railroad Co., of Pratt Mines, has recently added one Tough 26x14x48 pump one Knowles 12x12x18 duplex pump. Output of Pratt Mines division for month of August, 1888, 84,500 tons coke made. Output September 13th, 3,573 tons coal. Daily output will be 4,000 tons coal in sixty days. They have just finished a new prison at a cost of $18,000. Have also completed fifty coke ovens, and begun work on seventy-five more to be completed in sixty days. Have about completed a new reservoir of 1,000,000 gallons capacity for supplying coke ovens with water. Reservoir is eighty feet above ovens, giving good head for watering ovens. No. 3 shaft begun putting out coal on September 1st. Present output 250 tons daily, will be increased to 500 in ninety days.—[Tradesman.

The Jeffrey Manufacturing Company, of Columbus, O., gives a long, flattering account of the conditions of business. Among the shipments made recently from their establishment may be mentioned, one power coal drill to Reinecke & Co., Madisonville, Ky.; two mining machines and one power drill to the Cherokee & Pittsburg Coal Company, Pittsburg, Kan.; one power drill to the Canon City Coal Company, Brookside, Colo.; one mining machine to the Coal Bluff Mining Company, Clay City, Ind.; four mining machines to the Union Pacific Coal Company, Rock Springs, Wyo.; in addition to eight of these machines which that company have already in use in their No. 4 mine; three coal drills to the Sunny Side Coal Company, Evansville, Ind.; two power drills to the San Pedro Coal & Coke Company, of Carthage, N. M.; two mining machines to the Sand Coulee Coal Company, Great Falls, Mont.; two mining machines to the Spring Valley Coal Company, Spring Valley, Ill., etc., etc.

Southern Iron Production.

Alabama heads the list of Southern States in the production of pig iron, Tennessee and Virginia ranking next. The following table taken from the Baltimore *Manufacturers' Record* shows the relative position of some of the leading iron-producing States of the South, in tons:

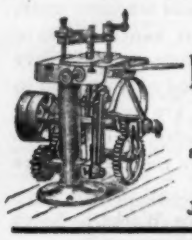
	1880.	1887.	Increase.
Alabama	77,190	292,762	215,572
Tennessee	70,873	250,344	179,471
Virginia	29,934	175,715	145,781
Georgia	70,000	82,000	12,000
West Virginia	27,947	40,947	13,000

The chief increase has been in Alabama, Tennessee, and Virginia, comparatively small changes having taken place in West Virginia and Georgia.

STEEL BLOOMS BILLETS SLABS — W. F. THORNTON — CLEVELAND, O.

THE GOULDS MANUFACTURING CO.

PUMPS AND HYDRAULIC MACHINERY.
Send for new No. 15 Catalogue.
27-37 Ovid St., SENECA FALLS N. Y. 60 Barclay St., NEW YORK.



MORTON MANUFACTURING CO.
MANUFACTURERS OF
Morton's Lightning Keyway Cutters & Key Makers
MADE IN SIX SIZES.
Cutting Keyways and making Keys from 24 inches long down to the smallest work, with accuracy and rapidity.
Send for circulars and description.
Ja189 ROMEO, - - - MICH.

CONDIT, FULLER & CO.,
PIG & BAR IRON.
122 WATER STREET, Room 23. } CLEVELAND, O. { WAREHOUSE: 81 to 95 River St., cor. Main.

CLEVELAND ROLLING MILL CO.,
—MANUFACTURERS OF—
BESSEMER STEEL RAILS,
Blooms and Billets, Steel Angles, Forgings, Bar and Spring Steel, Steel Street Rails, Steel Oil Barrel Hoops, Wire of all kinds, Iron and Steel Boiler Plates, Galvanized and Black Sheet Iron, Corrugated Iron Roofing, Sheet Steel.

Dalliba, Corrigan & Co.,
Dealers in
IRON ORE AND PIG IRON.
101 St. Clair St., Rooms 20 to 22.
CLEVELAND, O.

Tuttle, Oglebay & Co.,
COMMISSION DEALERS IN
IRON ORES,
from Marquette, Gogebic and Menominee Districts.
CLEVELAND, O. 46

WILLIAM F. JARVIS & CO.,
(Successors to CHAS. HIMROD & CO.)
DETROIT, MICH.,
Pig Iron.
Sales Agents for following brands Lake Superior Charcoal Iron:
Vulcan Furnace Co.
Detroit Iron Furnace Co.
Deer Lake Furnace Co.
Sales Agents for State of Michigan Tennessee Coal I. & R. R. Co.'s brands, viz.:
South Pittsburg, Sewanee, Alice and Ensley.
Brier Hill Iron and Coal Co.'s brands, viz.:
Brier Hill Scotch, Tod, Grace, and Bessemer,
and Globe Iron Co., Jackson, Ohio.

E. C. POPE,
COMMISSION DEALER IN
Iron Ore, Pig Iron
AND METALS.
CLEVELAND, OHIO.

J. H. OUTHWAITE. W. G. POLLOCK.
J. H. OUTHWAITE & CO.,
Exclusive attention given to
Lake Superior and Menominee Range
Iron Ore.
CLEVELAND, OHIO.

Pickands, Mather & Co.
IRON ORE AND PIG IRON.
Corner Bank and Superior Sts.,
CLEVELAND, O.

H. E. COLLINS & CO.,
ORES AND METALS,
34 Lewis Block,
PITTSBURGH, PA.

Saml. L. Mather, Prest. & Treas. Fred. A. Morse, Secty.
Cleveland Iron Mining Co.,
Dealers in Iron Ores
from their own mines near Marquette, Lake Superior.
Rooms 4 & 5 Mercantile Bank Building,
30 CLEVELAND, O.

COKE
FOUNDRY COKE.
72-hour Connellsville Coke.
W. J. RAINEY.
Mercantile Bank Bldg., Cleveland

Pittsburgh & Wheeling Coal Co.,
Miners and Shippers of
OHIO STEAM COAL AND COKE.
Mines on the Cleveland, Lorain & Wheeling R. R. Capacity, 2,000 tons daily.
Office, 29 Mercantile Bank Building,
CLEVELAND, O.
Lake Shipping Point, Lorain, Ohio.

H. P. Hussey. Geo. H. Pomeroy.
HUSSEY & POMEROY,
Exclusively Pig Iron,
Strong Foundry and American Scotch Irons, Gray Forge and Bessemer irons for steel purposes.
Room 57, Grand Arcade, Cleveland, O.

UNION ELECTROTYPE FOUNDRY
829 SHERIFF ST. CLEVELAND O

CLEVELAND BUSINESS DIRECTORY.

Bolt and Nut Works.

THE HOTCHKISS & UPSON CO. Manuf'rs. Machine, Plow & Elevator Bolts, Coach Screws. 15

Boiler Makers.

SMITH & TEACHOUT—(Established 1857.) Boilers, Tanks, Stills, etc. 644 Broadway.

Bridge and Boiler Builders.

BUCKEYE BRIDGE AND BOILER WORKS, mfrs. of Arch and Truss Bridges, Boiler Tanks and Oil Stills. Bet. Wasson St., and Case Ave.

Carriage Bolts.

THE COLWELL & COLLINS NORWAY BOLT CO., manufacturers of Philadelphia Carriage and Tire Bolts. 41

Coal, Iron and Ore.

ANDREWS, HITCHCOCK & CO., Briar Hill Coal and Pig Iron. 101 St. Clair St. 81

PICKANDS, MATHER & CO., Iron Ore and Pig Iron, Cor. Bank and Superior Sts. 61

SANGER, A. I., wholesale Scrap Iron, Nos. 173, 175 & 177 Merwin Street. 33

File Works.

INDUSTRY FILE WORKS, A. & H. Gough, manf'rs of Files and Rasps, equal to the best English file. Old files re-cut. All kinds of Job Grinding. Office and Works, 38 Columbus and 38 Winter street 13

Foundries

BOWLER & CO., Car wheels, Patent Chilled Frogs, and all kinds of castings. 9 Winter.

TAYLOR & BOGGIS FOUNDRY CO. Fine Gray Iron Castings. 65 to 73 Central Way.

FITZSIMONS WM. & SON, Rolling Mill and Machinery castings. Rolls a specialty. Nos. 426 to 432 Broadway. 64

Foundry Facings.

CLEVELAND FACING MILLS, Foundry Facings, Cor. Scranton & Carter Sts. 21

Hardware and Iron.

BINGHAM, WM. & CO., Hardware, Iron, Nails and Metals, 148 and 150 Water St.

CLEVELAND ROLLING MILL CO., manufacturers of Steel and Iron Wire and Steel Tire. 34

THE EBERHARD MF'G CO. manfrs of Carriage, Wagon and Saddlery Hardware. 25

Hardwood Lumber.

MARTIN & BARRISS, dealers in all kinds of Hardwood Lumber. 130 Central Way. 51

Lumber.

FISHER, WILSON & CO., Wholesale lumber dealers (pine & hardwood), rough and dressed lumber, timber, lath, shingles, etc. 47 Central Way. 82

Steel Stamps and Stencils.

FLEHARTY, J. H. & Co., Rubber Stamps, Seals, Stencils. 92 Seneca street. 54

BUSINESS DIRECTORY.

Akron, O.

MCNEIL, J. C. CO., Steam Boilers, Heavy Sheet Iron Work, &c. Repairing promptly executed.

TAPLIN RICE & CO., manuf'rs. of Stoves and Hollow Ware, dealers in Tinners' Stock, etc. 04

WEBSTER, CAMP & LANE MACHINE CO., Founders and Machinists, 12 Main street. 84

Alliance, O.

CHAPMAN G. L., builder of Engines and Machines Also Jobbing and Repairing.

Columbus, O.

CITY BOILER WORKS, manf's of Stationary, Portable, and Locomotive Steam Boilers. All work warranted. Borger Bros. & Co. 12

Canton, O.

NOVELTY IRON WORKS, Mill Work, Shafting, Engines, Imperial job printing press etc. 73

Hinckley, O.

ISHAM, W. S. Tin cans of every description Large job lots special prices. Correspondence solicited. 81

Meadville, Pa.

CURRY & CO. general jobbers in Castings of all kinds. 43

Mansfield, O.

MANSFIELD STEAM BOILER WORKS, Man'frs of Steam Boilers, Oil and Water Tanks, and all kinds of Sheet Iron Work. 03

Niles, O.

REEVES BROS., Manufacturers of Boiler Tank and Sheet Iron Work, etc. 84

Struthers, O.

SUMMERS BROS. & CO., manufacturers of Box Annealed Common and Refined Sheet Iron, and Superior Quality Shingle-Bands. 61

BUSINESS DIRECTORY.

Rochester, N. Y.

WOOD-WORKING MACHINERY. Send for Catalogue. J. S. Graham & Co. 43

GLEASON, WILLIAM, manufr. of Machinists' Tools, Lathes, Planers, and Pat. Gear Dressing Machines. 10 Brown's Rac.

ALEX. LAUGHLIN & CO.,
Engineers and Contractors,
WADE BUILDING, CLEVELAND, O.
Will contract to erect, equip and place in operation Rolling Mill Plants of every description.
Regenerative Gas Furnaces
—AND—
Artificial Gas Producers.
A SPECIAL FEATURE. ESTIMATES FURNISHED ON APPLICATION.

Walker's Tool Holder.

For holding drills and reamers for lathe work. Prevents breaking or slipping. Can also be used for drilling and reaming holes by hand, and for reaming holes under drill presses, etc. Five holders in a set. Made with ouble handle, when required.
Walker Mfg. Co., CLEVELAND, O.

New "PRINCESS" Tricycle.
J. A. Weston & Co., Mfrs.
34 LOCK ST. - - SYRACUSE N. Y.
Catalogues & Discounts to the trade.

Also Manufacturers of
—PATENT—
Steel Wheels
for the trade.

ECLIPSE ELECTROTYPE AND ENGRAVING CO.
ANDREWS & AUST PROPRIETORS
LITHOGRAPH BUILDING CLEVELAND, O.

BALL & SOCKET JOINT ALLOWING FAVORABLE ADJUSTMENT TO LIGHT
STEARNS' SILENT SAW VISES.
WITH RUBBER CUSHIONED JAWS
THE FINEST FINISHED THE LATEST IMPROVEMENTS, MF'G BY E.C. STEARNS & CO SYRACUSE, N.Y.
SEND FOR CIRCULAR
SOLD BY THE TRADE

The Daisy Patent Natual Gas Burner.
For all kinds of Stoves, Furnaces, and Open Grate. Will produce more heat than any other burners ever made. Manufactured by
Harmon, Gibbs & Co., - Corry, Pa.

MARKET REVIEW.

OFFICE OF IRON TRADE REVIEW.
CLEVELAND, O., WEDNESDAY EVENING, October 10, 1888.

Iron Ore.

The situation remains practically unchanged as far as the persistent demand on the part of purchasers and the continued inability on the part of producers to meet inquiries are concerned. It will be remembered that when the ore market first opened this season, three months later than at the usual time, the mining people found considerable trouble in placing their ores at anything like the figure they asked. The 1888 market opened with prices averaging a dollar less than that paid at the close of 1887, and these reduced prices were so much further reduced during June and a portion of July, that ores which in 1887 easily brought $7, went almost begging at $5.25. The reason for this was largely found in the failure of the steel mills and the railway interests to come to an understanding. The latter, remembering the $40 price they were forced to pay in 1887, combined this year in an attempt to keep the price down to $30, and in the wrangle, so much valuable time was lost, that when a break came at last, and orders were taken in Pittsburgh at $31.50, the railways were not in a position to order any large quantities of material for '88 delivery, confining themselves to necessary replacements and such extensions as were far enough advanced to allow of the laying of iron. Thus, Bessemer ores were kept out of the market, and non-Bessemers were naturally held back. During the end of July there sprang up a sudden demand from the most conservative class of iron-workers, and pig stocks, which until then had been accumulating, began to find a market. Still, there were many buyers who had no confidence in the market, and who, having just undergone the disheartening experience of selling low-priced iron made from high-priced ores, felt little inclined to enter the ore market until the demand should prove steady. In September, there came a sharp advance, which brought with it a flood of inquiries for ores of all grades and kinds, with its corresponding advance in lake freights. The conditions of the mining season had all along pointed to an output equal to about 75 per cent. of the '87 tonnage, and the knowledge of the decreased supply in the face of a sudden and imperative demand, drove ores up several notches. For some weeks past not a pound of ore has been mined but what found immediate shipment, and to-day ore dealers are making sales by the cargo, contingent upon delivery before the close of navigation. The lake shipments thus far, together with the unsold ore on dock, May 1, indicate sales of 4,200,000 tons, which, if the season permits any considerable shipments, is likely to be increased by another 300,000 tons. It will be seen, therefore, that the mining season, which opened as the dullest and most unprofitable in many years, is likely to close as the banner year in the history of the Lake Superior mining business.

Pig Iron.

The market continues to be satisfactory, viewed from the furnacemen's standpoint. The feeling is cheerful, and while prices are not thought likely to go much higher, entire confidence is felt in the maintenance of present quotations. The demand is quite strong, and in view of the accumulation of orders, furnacemen feel disposed to make little concession to buyers. While a prime quality of standard iron brings $18 cash at the Valley furnaces, makers will not undertake to book orders for February or March delivery short of $1 more. This is not to be taken as an indication of another advance, but rather in the light of a desire on the part of furnacemen to protect themselves in good season against any emergency that may arise later on. There is a sharp inquiry for mill irons, which bring readily $16.50 cash at the furnace. Bessemer pig is also in large demand, and the enormous consumption, if maintained until the end of the year, will practically wipe out all pig stocks. We quote, f. o. b., Cleveland, four months:

CHARCOAL PIG IRON.

Lake Superior Charcoal all numbers	22 00@24 50

BITUMINOUS AND COKE IRON.

No. 1 Bessemer	$18 70@19 20
No. 1 foundry, all lake ores	18 20@18 70
No. 2 same	17 20@17 70
No. 1 foundry, lake ores, with cinder mixture	17 20@17 70
No. 2 same	16 20@16 70
No. 1 silvery, native Ohio ores	16 50@17 50
No. 2 same	15 50@16 50
No. 1 gray forge, red short	16 70@17 20
No. 1 gray forge, neutral	16 20@17 70
No. 1 American Scotch (Black Band)	17 70@18 20
No. 2 American Scotch "	16 70@17 70

Manufactured Iron.

Mill men report a large trade in nearly every branch of the business, and their order books indicate a healthy state of trade. Bar iron is strong at $1.70 at the mills, with five cents added out of store. The demand is improving and better prices are expected. Sheets are still scarce, the mills refusing to book orders in any large quantities for '88 delivery. Rails are dull, and practically out of demand.

Scrap Iron.

The combination is still holding up old American rails at $25 and over, but no sales are reported in this market. Skelp is worth $20, and axles bring from $24 to $26, according to size. There is no demand for miscellaneous scrap or car wheels.

Hardware.

Jobbers and dealers have no time to give quotations, which is an indication of a rushing Fall trade.

CINCINNATI PIG IRON MARKET.

Reported for the IRON TRADE REVIEW by Rogers, Brown & Co.

The market has been firm, but quiet, during the week past. It is not expected, by leading sellers, that there will be much buying prior to the Presidential election, beyond what foundries and mills may require for immediate wants. There is a general disposition to wait and see what will be the result of the great contest over tariff. The rising market in grains, provisions and stocks indicate strength in the general situation, and it is hardly thought possible that the lines of manufacturing calling for iron can fail to feel the general stimulus. Shipments are going forward very heavily, but there are few furnaces that are fully keeping up with their orders. We quote for cash, f. o. b. Cincinnati (Oct. 6):

HOT BLAST FOUNDRY.—Ohio and Southern Coke, No. 1, $17 50@$18 50; Ohio and Southern Coke, No. 2, $16 50@$17 50; Ohio and Southern Coke, No. 3, $15 50@$16 00; Ohio Soft Stonecoal; No. 1, $17 00@$17 50; Ohio Soft Stonecoal No. 2, $15 50@$16 00; Mahoning and Shenango Valley, $17 50@$18 50. CHARCOAL IRON.—Hanging Rock Charcoal No. 1, $21 00@$22 50; Hanging Rock Charcoal No. 2, $19 50@$22 00; Tennessee and Alabama Charcoal No. 1, $18 50@$19 50; Tennessee and Alabama Charcoal No. 2, $17 50@$18 00. FORGE—Strong Neutral Coke, $14 75@$15 00; Mottled Neutral Coke, $13 75@$14 00; Cold Short Coke, $14 50@$14 75. CAR WHEEL AND MALLEABLE—Southern Car Wheel, $20 00@25 00; Hanging Rock Cold Blast, $22 00@$25 00: Lake Superior Malleable & Car Wheel, $21 00@$22 00.

DETROIT PIG IRON MARKET.

Reported for the IRON TRADE REVIEW by William F. Jarvis & Co.

Nothing of a startling nature has occurred since our report of a week ago. The volume of business has been somewhat larger and several good-sized orders for Lake Superior charcoal have been booked. Most buyers have ceased to expect former quotations, but are willing to place orders at present prices for future delivery. However, very few furnacemen desire to sell for delivery after January 1st, unless at an advance. The demand for high numbers of Lake Superior charcoal continues, and old wheels are hard to secure at reasonable figures. Consumers are asking that deliveries on orders already placed be hastened, thus showing that they are using faster than was expected. For the present we quote as follows (Oct. 8):

Lake Superior Charcoal, all numbers, $20 00@$20 50; Lake Superior Coke, all ore, $19 75@$20 25; Lake Superior coke, cinder mixed, $18 50@$19 00; Standard Ohio Blackband, $19 75@$20 25; Southern No. 1, $17 75@$18 25; Southern Gray Forge, $16 25@$16 75; Southern Silvery, $17 00@$17 50; Jackson County (Ohio) Silvery, $18 50@$19 00; Old Wheels, $20 50@$21 50.

LOUISVILLE PIG IRON MARKET.

Reported for the IRON TRADE REVIEW by Geo. H. Hull & Co.

The market for the past week has been quiet, and orders have been scarce. Prices are firm, and buyers have been compelled to pay the the recent advance. The outlook for the present is for a slight advance, and if there is much of a demand, it may be easily obtained. Old rails remain firm at $24.00, wheels at $21.00. We quote (Oct. 8):

Southern Coke, No. 1, Foundry, $17 00@$18 00; Southern Coke, No. 2, Foundry, $16 00@$16 50; Southern Coke, No. 2½, Foundry, $15 50@$16 00; Hanging Rock Coke, No. 1, Foundry, $17 25@$17 75; Hanging Rock Charcoal, No. 1, Foundry, $21 00@$23 25; Southern Charcoal, No. 1, Foundry, $18 00@18 50; Silver Grey, different grades, $14 50@$15 25; Southern Coke, No. 1, Mill Neutral, $14 75@$15 25, Southern Coke, No. 2, Mill, Neutral $13 75@$14 75; Southern Coke, No. 1, Mill, Cold Short, $14 25@$14 75; Southern Charcoal, No. 1, Mill, $15 75@$16 50; White and Mottled, different grades, $13 50@$13 75; Southern Car Wheel, Standard Brands, $23 00@$24 00; Southern Car Wheel, other brands, $19 25@$21 25; Hanging Rock, Cold Blast, $22 25@$25 25; Hanging Rock, Warm Blast, $19 25@$20 25

CHICAGO PIG IRON MARKET.

Reported for the IRON TRADE REVIEW by Rogers, Brown & Co., W. W. Backman, Resident Agent.

Business at this centre is, for the present, confined to purchases for immediate wants. Shipments on contracts are very heavy, and consumption is very large. The field is full of new enterprises, and if no misfortune overtakes our industrial system, the general feeling is that we shall see a large activity in all lines. Sales of Lake Superior charcoal iron were made since last reports at $21 cash Chicago, but most furnaces are holding at $20 cash. Most producers of this class of iron have their products sold for the Fall and Winter.

ST. LOUIS PIG IRON MARKET.

Reported for the IRON TRADE REVIEW by Rogers, Brown & Co

There is a fair volume of business going, and some leading buyers talk of making further purchases soon. The demand is principally for Southern foundry iron and Ohio softeners. Lake Superior charcoal iron for car wheels is also in fair request. The car works are feeling the effect of a more liberal demand for selling stock from the railroads. The fair has somewhat interfered with the regular run of business during the week. We quote (Oct. 6):

Charcoal Foundry—Southern No 1, $18 50@$19.50; Southern No. 2, $18 00@$19 00; Missouri No 1, $17 00@18 00. Missouri. No. 2, $16.50@$ 7.50. Coal and Coke Irons.—Southern No 2, $17 00@$18 00; Ohio Softeners, $18 00@21 00. Mill Irons—Southern No. 1, $15 00@$16 50; Southern No. 2, $15 00@16 00; Missouri, $16 00@16 50. Car Wheel & Malleable Irons.—Southern. $20 00@24 00; Lake Superior. $20 50@21 50; Connellsville Coke, East St. Louis, $4 45; Connellsville Coke, St. Louis, $4 60.

PITTSBURGH PIG IRON MARKET.

Reported for the IRON TRADE REVIEW by A. H. Childs.

The tone of the market during the past week was healthful, although sales were confined to small lots for immediate necessities, and it is not probable that there will be extensive trading until stocks at mills become so reduced as to bring buyers into the market. Makers of standard brands of pig iron are well supplied with orders and refuse to make new contracts at less than full quoted rates. Quotations are (Oct. 8):

PIG IRON.—No. 1 Foundry, $17.50@$18.50; No. 2 Foundry, $17.00@$17.50; Gray Forge, $16.50@$17.00; White and Mottled, $15.00@$16.00; Warm Blast Charcoal, $22.00@$25.00; Cold Blast Charcoal, $24.00@$28.00; Bessemer, $18.50@$19.50.

Iron Fronts.

Sheet iron fronts for buildings in place of stone or cast iron, are gradually growing in favor in and about New York, and when better known, and their durability acknowledged, they will, no doubt, on account of their cheapness and adaptability to various requirements, become great favorites. Among recent work of this character, a building in Brooklyn is worthy of special notice. It is located on Brooklyn avenue, near Atlantic, and is a four-story apartment house. The entire front above the first story, which is of brick, is made of No. 20 galvanized iron. Each section of the building has a bay-window running the entire height, of which the bases and panels are elaborately ornamented. In addition to the bays, the front is further relieved and diversified by panels and pilaster ornaments with scrolls and rosettes of a bold and effective design. That uneven, wavy appearance too frequently seen in sheet iron work is entirely overcome on this job, by the iron being crimped before making up.—[Carpentry and Building.

Land Excursion via the Pennsylvania Lines.

Land Explorers' Excursion tickets at low round trip rates will be sold on October 9th and 22d, via the Pennsylvania Lines west of Pittsburgh to representative points in Kansas, Colorado, Nebraska, Iowa, Minnesota Dakota, Montana, Wyoming, Indian Territory, Tennessee, Mississippi, Louisiana and Texas. These tickets will be good for return passage within thirty days from date of sale. Further information can be secured by calling on or addressing the passenger or ticket agent in your vicinity of the Pennsylvania Company.

HERR LICHT, the authority on sugar beet statistics, says the growing crop in Europe will be at least 300,000 tons larger than last year, when the yield was returned as 2,412,050 tons.

THE tiniest of screws go into watches. The smallest is 4-1000 of an inch in diameter.

LIST OF PATENTS.

Relating to Iron, Steel, Metal, Machinery, Hardware and Mining Interests.

Reported expressly for this paper by H. T. Fisher, (late Ex. U. S. Patent Office), Patent Attorney, 34 Blackstone Building, Cleveland, O.

BEARING DATE OCTOBER 2, 1888.

Alloy of copper, nickel, and lead, G. F. Pottle Medford, Mass.
Belting machine, T. W. Graham, Dubuque, Iowa.
Casting metal ingots, apparatus for, W. Duffelmann, Germaniahütte, Prussia, Germany.
Chill mold apparatus, W. Fawcett, Jersey City, N. J.
Etching and producing inextinguishable metallic deposits upon bright metal surfaces, E. Nienstaedt, Berlin, Germany.
Fuel, heat, D. Aitkman, Montreal, Quebec, Canada.
Furnaces, feeding apparatus, H. Barr, Detroit Mich.
Heat, means for utilizing boiler, furnace and exhaust steam, W. Oliphant, Jersey City N. J.
Lathing, machine for opening out metallic, J. R. Branden, Detroit, Mich.
Metallic tube, L. F. Betts, New York, N. Y.
Rolling metal, R. A. Carter, Pittsburgh, Pa.
Rolling mill apparatus, F. H. Daniels, Worcester, Mass.
Sheet metal bending machine, L. Coburn, Holyoke, Mass.
Spirals from flat metal bars, machine for forming, L. Gathmann, Chicago, Ill.

$60 | AMERICAN GIANT DYNAMO. | $60

Electro-Plating and Electrotyping Machines

IN ALL SIZES.

FROM $60 UPWARDS.

Cheapest and Best in the Market.

Headquarters for everything in the Plating and Polishing line.

NICKEL PLATING AND Polishing Materials

ZUCKER & LEVETT CHEMICAL CO.,

ESTABLISHED 1863, INCORPORATED 1881.

SOLE MANUFACTURERS & PATENTEES,

Works: 538 to 564 W. Sixteenth St. Office: 36 to 40 Eleventh Ave., New York, U.S.A.

ENLARGED.

Rand, McNally & Co.'s

Business Atlas

1889.

Now in Press. New Size of Page, 15 x 21 Inches.

IT will contain new large-scale double-page maps of all important States (no cut-up maps).

The entire arrangement will be new, embodying the most improved methods of indexing and reference, clearly showing the location, population, and commercial advantages of over 200,000 towns in the United States, Canada and Mexico.

Descriptive circular, printed on one of the maps, worth 35 cents, sent free on application.

RAND, McNALLY & CO.,
148 MONROE STREET, CHICAGO.

New York Store, 323 BROADWAY.

EMERY WHEEL

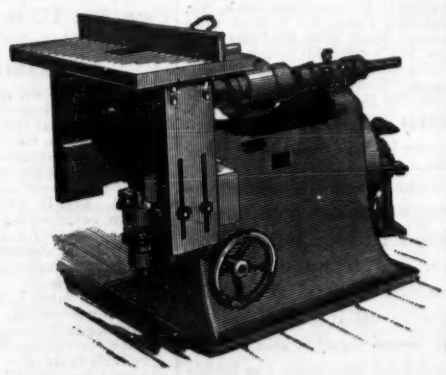
Surfacing Machine.

Base of machine has sufficient flare to give solid floor foundation.

Table is so supported that it cannot spring under heavy weights. Solid emery wheels or wood covered wheels can be used and table is easily adjusted to wearing away of wheel. Machine is well proportioned and thoroughly built. Write for circular.

Springfield Glue & Emery Wheel Co.

SPRINGFIELD, MASS.



HERCULES POWDER

SEND FOR DESCRIPTIVE PAMPHLET.

Stump before a blast. | Fragments after a blast.

STRONGEST and SAFEST EXPLOSIVE

Known to the Arts.

POWDER, FUSE, CAPS,

Electric Mining Goods,

AND ALL TOOLS FOR STUMP BLASTING,

FOR SALE BY THE

HERCULES POWDER COMPANY,

40 Prospect Street, Cleveland, Ohio.

J. W. WILLARD, Manager.

HERCULES,
THE GREAT STUMP AND ROCK
ANNIHILATOR.

The Van Nostrand Science SERIES.

18mo, Green Boards. Price 50c Each.

AMPLY ILLUSTRATED WHEN THE SUBJECT DEMANDS.

No. 1—Chimneys for Furnaces, Fire-Places and Steam Boilers. By R. Armstaong, C. E., 2d Edition, with an Essay on High Chimneys; by Pinsger.
No 2—Steam Boiler Explosions: by Zerah Colburn.
No. 3—Practical Designing of Retaining Walls; by Arthur Jacob, A. B.
No. 4—Proportions of Pins used in Bridges; by Chas Bender, C. E.
No 5—Ventilation of Buildings; by W. F. Butler Edited and Enlarged by Jas. L. Greenleaf. 2d Edtion
o. 6—On the Designing and Construction of Storage Reservoirs; Arthur Jacob, A. B.
No. 7—Surcharged and Different Forms of Retaining Walls; By Jas. S. Tate, C. E.
No. 8—A Treatise on the compound Engine; by John Turnbull, Jr. 2d Edition. With Additions by Prof. S. W. Robinson
No. 9—Fuel; By C William Siemens, D. C. L., to which is appended the Value of Artificial Fuels as Compared With Coal; by John Wormald, C. E.
No. 10—Compound Engines; Translated from the French of A. Mallet. With Results of American Practice, by R. H. Buel, C. E. 2d Edition.
No. 11—Theory of Arches; By Prof. W. Allan.
No. 12—A Theory of Voussoir Arches; by Prof. W E Cain.
No. 13—Gases Met With in Coal Mines; By J. J. Atkinson 3d Edition. Revised. To which is added The Action of Coal Ducts. by Ed. H. Williams, Jr., E. M.
No. 14—Friction of Air in Mines; by J. J. Atkinson.
No. 15—Skew Arches; by Prof. E. W. Hyde, C. E.
No. 16—A Graphic Method for Solving Certain Algebraical Equations. by Prof. Geo. L. Vose.
No. 17—Water and Water Supply; by Prof. W. H. Corfield, M. A.
No. 18—Sewerage and Sewage Utilization; by Prof. W. H. Corfield.
No 19—Strength of Beams Under Transverse Loads; by Prof. W. Allan.
No. 20—Bridge and Tunnel Centres; by John B. McMaster, C. E.
No 21—Safety Valves; by Richard H. Buel, C. E.
No. 22—High Masonry Dams; by John B. McMaster.
No. 23—The Fatigue of Metals Under Repeated Strains, with various tables of results of experiments. From the German of Prof. Ludwig Spangenberg; with a preface by S. H. Shreve.
No. 24—A Practical Treatise on the Teeth of Wheels, with the theory of the use of Robinson's odontograph; by Prof S. W. Robinson.
No 25—Theory and calculations of Continuous Bridges; by Mansfield Merriman, C. E.
No. 26—Practical Treatise on the Properties of Continuous Bridges; by Charles Bender.
No. 27—On Boiler Incrustation and Corrosion; by F. J. Rowan.
No. 28—On Transmission of Power by Wire Ropes; by Albert W. Stahl.
No. 29—Injectors: Theory and Use; translated from the French of M. Leon Peuchet.
No. 30—Terrestrial Magnetism and the Magnetism Iron Ships; by Prof. Fairman Rogers.
No. 31—The Sanitary Condition of Dwelling Houses in Town and Country; by George E. Waring, Jr.
No. 32—Cable Making for Suspension Bridges, as exemplified in the construction of the East River Bridge; by Wilhelm Hildenbrand, C. B.
No. 33—Mechanics of Ventilation; by George W. Rafter, C. E.
No. 34—Foundations; by Prof. Jules Gaudard C. E.; translated from the French.
No. 35—The Aneroid Barometer: its Construction and Use; compiled by Prof. G. W. Plympton; 3d edition.
No. 36—Matter and Motion; by J. Clerk Maxwell.
No. 37—Geographical Surveying: its Uses, Methods and Results; by Frank De Yeaux Carpenter
No. 38—Maximum Stresses in Framed Bridges; by Prof. Wm. Cain.
No. 39—A Handbook of the Electro-Magnetic Telegraph; by A. E. Loring, a practical telegrapher; 2d edition.
No. 40—Transmission of Power by Compressed Air; by Robert Zahner, M. E.
No. 41—Strength of Materials; by William Kent.
No. 42—Voussoir Arches, applied to Stone Bridges, Tunnels, Culverts and Domes; by Prof. Wm. Cain.
No. 43—Wave and Vortex Motion; by Dr. Thomas Craig, of John Hopkins University.
No. 44—Turbine Wheels; by Prof. W. P. Trowbridge.
No. 45—Thermodynamics; by Prof. H. T. Eddy.
No. 46—Ice-making Machines; from the French of M. Le Doux.
No. 47—Linkages: the Different Forms and Uses of Articulated Links; by J. D. C. DeRoos.
No 48—Theory of Solid and Braced Arches; by Wm. Cain, C. E.
No. 49—On the Motion of a Solid in a Fluid; by Thomas Craig, Ph D.
No. 50—Dwelling Houses; their Sanitary Construction and Arrangements; by Prof. Wm. H. Corfield.
No. 51—The Telescope, its Construction, &c.; by Thomas Nolan.
No. 52—Imaginary Quantities; translated from the French of M. Argand; by Prof. Hardy.
No. 53—Induction Coils: how made and how used 3d edition.
No 54—Kinematics of Machinery; by Prof. Kennedy; with an introduction by Prof. Thurston.
No. 55—Sewer Gases; by A. De Varona.
No. 56—The Actual Lateral Pressure of Earthwork; by Benj Baker, M. Inst C E.
No. 57—Incandescent Electric Lights; by Compt. Th. Du Moncel and Wm. Henry Greece 2d edition.
No. 58—The Ventilation of Coal Mines W. Fairley, M. E., F. S. S.
No. 59—Railroad Economics; or Note with Comments; by S. W. Robinson, C. E.
No. 60—Strength of Wrought-iron Bridge Members; by S. W. Robinson, C. E.
No. 61—Potable Water, and the Different Methods of Detecting Impurities; by Chas. W. Folkard.
No. 62—The Theory of the Gas Engine; by Dugald Clerk.
No. 63—House Drainage and Sanitary Plumbing; by W. P. Gerhard; 2d edition.
No. 64—Electro-Magnets; by Th. Du Moncel.
No. 65—Rocket Logarithms to Four Places Decimals.
No. 66—Dynamo-Electric Machinery; by Silvanus P. Thompson.
No. 67—Hydraulic Tables; by P. J. Flynn, C. E
No 68—Steam Heating; by Robert Briggs.
No. 69—Chemical Problems; by Prof. Foye; 3d edition.
No 70—Explosive Materials; by M. P. E. Berthelot.
No. 71—Dynamic Electricity; by John Hopkinson, J. A. Schoolbred and S. E. Day.
No. 72—Topographical Surveying; by Geo. J. Specht, Prof. A. S. Hardy, John B. McMaster and H. F. Walling.
No. 73—Symbolic Algebra; or the Algebra of Algebraic Numbers; by Prof. W. Cain.
No. 74—Testing Machines; their History, Construction and Use; by Arthur V. Abbott.
No. 75—Recent Progress in Dynamo-Electric Machines; being a supplement to Dynamo-Electric Machinery. by Prof. Silvanus P. Thompson.
No. 76—Modern Reproductive Graphic Processes; by Lieut. Jas. S. Pettit, U. S. A.
No 77—Stadia Surveying; the theory of Stadia Measurements; by Arthur Winslow.
No. 78—The Steam Engine Indicator, and its use, by W. B Le Van.
No. 79—The Figure of the Earth; by Frank C. Roberts, C. E.
No. 80—Healthy Foundations for Houses; by Glenn Brown.
No. 81—Water Meters: Comparative Tests of Accuracy, Delivery, etc. Distinctive Features of the Worthington, Kennedy, Siemens and Hesse Meters; by Ross E. Browne.
No. 82—The Preservation of Timber, by the use of Antiseptics; by Samuel Bagster Boulton C. E.
No. 83—Mechanical Integrators; by Prof. Henry S. H. Shaw, C. E.
No. 84—Flow of Water in Open Channels, Pipes, Conduits, Sewers, etc.; with tables; by P. J. Flynn, C. E.
No. 85—The Luminiferous Æther; by Prof. D Volson Wood.
No. 86—Handbook of Mineralogy: Determination and Description of Minerals found in the United States; by Prof J. C. Foye.
No. 87—Treatise on the Theory of the Construction of Helicoidal Oblique Arches; by John L. Culley, C. E.
No. 88—Beams and Girders. Practical Formulas for their Resistance; by P. H. Philbrick.
No. 89—Modern Gun Cotton: Its Manufacture Properties and Analysis; by Lieut. John P. Wisser, U. S. A.
No. 90—Rotary Motion; as Applied to the Gyroscope; by Gen. J. G. Barnard.
No. 91—Leveling: Barometric, Trigonometric and Spirit; by Prof. I. O. Baker.

LATE ADDITIONS.

No. 92—Petroleum: its Production and Use; by Boverton Redwood. F. C. F.
No. 93—Notes Embodying Recen Practice the Sanitary Drainage of Buildings; with memoranda on the cost of Plumbing Work; by Wm. Paul Gerhard, C. E.
No. 94—The Treatment of Sewage; by Dr C. Meymott Tidy.

CLEVELAND PRINTING AND PUB. CO.,
Cor. Wood and St. Clair Sts., Cleveland, O.
** Copies sent by mail on receipt of price.

CLEVELAND WHOLESALE PRICES.

HARDWARE.

Anvils. per lb

American.....10cts dis 20@20&5
Wrights.....10c

Anvil Vise and Drill.

Millers Falls Co. $18.....dis 2
Cheney Anvil and Vise.....dis 2

Augers and Bits.

Common augers and bits.....dis 60&10
Snells.....dis 60&5
Cook's Douglass Mfg. Co.....dis 5
Russell Jennings' augers and bits.....dis 2
Expansive Bits, Clark's small. $18; large, $26.....2
Hollow Augers, Ives'.....dis 25&10
Hollow Augers, Bonney's Adjust. ₱ doz. $48.....dis 40&10
Hollow Augers, Stearns' Adjust. ₱ doz., $48.....dis 20&10
Gimlet bits.....per gross $4 50
Standard Bit Stock Drills.....dis 50&10&10
Ship Augers.....dis 15@15&10

Awl Hafts.

Sewing, brass ferrule,.....₱ gross $3.50, dis 45
Patent sewing, short.....₱ doz $1.00, dis 40&10
Patent sewing, long.....$1.20 ₱ doz net
Patent peg, plain top, ...$10.00 ₱ gro., dis 45
Pat. peg, leather top. .....$12.00 ₱ gro., dis 45

Awls, Brad Sets, &c.

Awls, Sewing, Common.....₱ gross $1.75—dis 35
Awls, Shouldered Peg ₱ gross.....$3.00—dis 45
Awls, Patent Peg.....₱ gross 75c—dis 45
Awls, Shouldered Brad.....$3.00—dis 25
Awls handled brad.....$7.80—dis 30
Awls handled, scratch.....$7.50 ₱ gro dis 35&10
Awls, socket scratch.....$1.50 ₱ doz dis 25
Brad Sets. No. 42, $10.50; No. 43. $12.50.....dis 60
Brad Sets, Stanley's Excelsior, No. 1. $7.50.....dis 30

Axes.

Makers' and Special Brands—
First quality.....₱ doz. $7 00
Others.....₱ doz. $5 75@$6
Full polished.....$8 00

Axle Grease.

Frazier's, in bulk.....keg ₱ lb 4c; pail 5c net
Frazier's, per gross.....$9.50

Bag Holders.

Sprengle's pat., ₱ doz $18.....dis 60

Balances.

Spring balances.....dis 45
Common 24 lb.....₱ doz $1.50 dis 50

Bells.

Hand, light Brass.....dis 70
Hand, White Metal.....dis 60&10
Hand, Silver Chime.....dis 25&10&5
Hand, Globe (Cone's Patent).....dis 25&10@35
Gong, Abbe's.....dis 25&10
Gong, Nichols.....dis 40
Gong, Barton's.....dis 40&10
Cow, western.....Sargent's List 70
Call.....dis 33⅓
Farm bells.....dis 70
Steel alloy, church and school.....dis 40

Bellows. Discount.

Blacksmith's..... { Hill's.....40 / Bullock's.....5 &10
Moulders, ...discount 40
Hand, ...discount 40

Belting, Rubber.

Boston Belting Co.'s standard.....dis 60&10
" " " extra.....dis 50&10
" " " best.....dis 45
Cleveland Rubber Co., extra standard...dis 40&10
Shultz Raw Hide Leather Belting, single, dis 30
" " " double, dis 35
Standard, oak tanned.....dis 50
Alexander Brothers' Pure Oak Tanned—
New list Oct. 1st, 1887, less.....35

Bench Stops.

Hotchkiss's ₱ doz $5.00.....dis 10
Weston's ₱ doz No. 1, $10.00; No. 2, $9 dis 25&10&5
Morrill's.....₱ doz $9.00 dis 50

Bit Holders.

Extension, Barber's.....₱ doz $15 00, dis 33⅓
Diagonal.....₱ doz $24.00 dis 40
Angular.....₱ doz $24 00, dis 40

Blind Staples.

Barbed ⅛ inch and larger.....₱ lb 8@8½c net
Barbed ⅝ inch.....₱ lb 9@9½c net

Bolts.

Cast iron barrel bolts..... 70
Cast Iron shutter bolts, etc..... 70
Cast iron chain bolts.....65
Ives patent door bolts..... 55
Wr't iron barrel bolts..... 70
Wrought iron square bolts..... 70
Wrought shutter bolts..... 60
Sargent's list
Carriage com. new list..... 75&2½
Tire, common, new list.....65&10
Carriage and tire, Philadelphia pattern.....75&10
Stove bolts.....60
Plow bolts.....50
Machine.....75
Ends.....dis 75

Blind Fasteners.

Van Sand's Screw Pattern $15 ₱ gross—dis 60&10
Van Sand's Old Pattern.....$15 ₱ gross—dis 50&10
Automatic for wood.....$10.50 } 30
" " brick.....$15.50 }

Borax.

₱ lb.....10c

Boring Machines.

Without augers.	Upright	Angular
Snell's. Rice's patent	5 50	6 75 dis 40&10
Lawrence	5 50	6 75 dis 45@45&10
Other machines	2 35	2 75 net
Phillips, with augers	6 00	7 00, 25

Braces.

Barber's.....discount 50
Spoffard's Patent.....discount 50@50&10
Bartholomew's Nos. 25, 27, 30.....dis 50&10
Bartholomew's Nos. 117, 118, 119 .....dis 70
Amidon's corner brace .....dis 40@40&10
Pecks.....dis 66

Brackets.

Shelf, plain, Sargent's list .....55&10
Fancy " " .....dis 60&10
Reading, plain .....dis 55&10
Reading, rosette.....dis 60&10

Bright Wire Goods.

Regular List.....75&10@80&10

Broilers.—Henis' self basting.

Inch	9	10	9x11
Per doz	$4 50	5 50	6 50

Buckets, Galvanized.

Iron clad 10 qt $2 75; 12 qt $3 00; 14 qt $3 75

Bull Rings.

Humason, Beckley & Co.'s.....dis 70&10
Peck, Stow & W. Co.'s .....dis 50&10
Ellrich Hardware Co., white metal low list dis @50&10

Butts. Discount

Wrought brass .....70&10
Cast brass, loose joint.....33⅓&10to33⅓&10&10
Cast Iron—
Fast joint, narrow .....50&10&5
Fast joint, broad.....55&10&5
Loose joint.....66⅔&10
Loose joint, jap.....66⅔&10
Loose joint, jap. with acorns.....66⅔&10
Loose pin, acorns.....66⅔&10
Loose pin, japanned acorns.....66⅔&10
Loose pin, acorns, japanned, plated tips...66⅔&10
Wrought steel—
Wrought, fast joint narrow..... 65&10
Wrought, fast joint broad..... 65&10
Wr't loose joint broad..... 65&10
Table Butts, back flaps, etc..... 65&10
Regular inside blind..... 65&10
Light inside blind..... 65&10
Loose pin..... 65&10
Light loose pin..... 65&10

Can Openers.

Sprague No. 1 $2.00, 2 $2.25, 3 $2.50,.....dis 50&10
Star.....$4 00 net
Domestic.....₱ doz $2 50, dis 45
National.....$1 25, dis 45

Caps—Percussion, ₱ 1000.

Hicks & Goldmark's
F. L. Waterproof, 1-10's 50c
E. B. Trimmed Edge, 1-10's 65c
E. B. Ground Edge, Cent. Fire, 1-10's 70c
Double Waterproof, 1-10's 1.40
Musket Waterproof, 1-10's 54c
G. D.....30
Elys waterproof central fire.....$1.60
Elys E. B 56c

dis. 35

Cartridges.

Rim fire.....discount 50&5
Pistol and rifle.....discount 25&5
Military and sporting.....discount 15&5

Carpet Stretchers.

Cast steel, polished. .....₱ doz $3.25
Cast iron, steel points.....per doz 80c
Socket .....₱ doz $1 75
Bullard's. .....dis 25

Cattle Leaders.

Humason, Beckley & Co.'s .....dis 70
Sargent's.....dis 66⅔&10
Peck, Stow & W. Co.....dis 50&10

Carpet Sweepers.

Queen.....₱ doz $16.00
Mystic.....₱ doz $16
Cottage .....₱ doz $15
Queen, with band .....₱ doz $18
King .....₱ doz $30
Garland .....₱ doz $18

Cards.

Horse and Curry .....dis 10

Casters.

Bed .....
Plate .....
Shallow Socket .....
} dis 50&10@60&5
Deep Socket.....dis 40&10
Yale Casters, list May, 1884, ...dis 30 &10@40
Martin's patent .....dis 45&10

Chains.

Trace, 6¾-10-2.....₱ pair 1.05
Trace, 8¾-10-3.....₱ pair 92c
Trace, 7-10-2.....₱ pair 1.11
} dis 50&5@50&10
German Halter Chain, list June, 1884.....dis 55
German Coil, list of June, 1881.....dis 55
Galvanized Pump Chain .....₱ lb 6½
Jack Chain, Iron .....70&10
Jack Chain, Brass.....dis 70&10

Chalk.

White .....₱ gross 55c
White Crayon .....₱ gross 12@12½c
Red 75c
Blue 85c

Chisels.

Socket Framing and Firmer .....dis 75@ 75& 5
Socket Framing and Firmer, Buck. Bros.....dis 25
Socket Firmer & Framing, L. & I. J. White.....dis 30@30 & 5
Tanged Firmers.....dis 40

Clamps.

Snow's adjustable, iron.....dis 40
Hammer's adjustable, iron.....dis 15
Sargent's cabinet, iron .....dis 66⅔&10

Clips.

Axle and spring bar, Norway iron..... dis 55&5&5
Wrought-Iron felloe clips.....₱ lb. 5½c
Steel felloe clips.....₱ lb 6c

Cockeyes.

discount.....50

Cocks, Brass.

Hardware list .....dis 40

Coffee Mills.

Enterprise.....20 & 10@30

Compasses, Dividers, &c.

Compasses.....dis 70@70&10
Calipers.....dis 70@70&10
Dividers .....dis 70@70&10
Bemis & Call Co.'s Dividers.....dis 50&10
Bemis & Call Co.'s Compasses & Calipers..dis 45&5
Bemis & Call Co.'s Wing & Inside or Outside .....dis 45&5
Bemis & Call Co.'s Double.....dis 50&10
Bemis & Call Co.'s (Call's Patent Inside) dis 25&5
Excelsior .....dis 50
Cook's Extension.....dis 25
J. Stevens & Co.'s Calipers and Dividers.....dis 25&5

Coopers' Tools.

Bradley's.....discount 20
Barton's.....discount 20
L. & I. J. White.....20 & 5

Corkscrews.

Humason, Beckley Mfg. Co.....dis 40
Clough's patent .....dis 33⅓

Corn Knives.

Clipper.....2.00
X. L. C. R.....4.50
Russetts.....6.50

Cradles.

Grain.....dis 40&10@50

Crowbars.

Cast steel.....₱ lb 4
Iron, steel points..... 3½

Curry Combs.

Fitch's Pattern.....dis 40
Rubber.....₱ doz. $10.00, dis 25

Cutlery.

Table .....net
Excelsior Pocket .....net

Dog Collars.

Embossed gilt.....dis 30&10
Leather.....dis 40

Door Springs.

Torrey's Rod, regular size.....₱ doz $1.30
Gem (Coil); list April 19, 1886,.....dis 10

Drawing Knives.

Douglass & Middletown.....dis 75@75&10
L. & I. J. White.....dis 20 & 5
Adjustable handle.....dis .5

Drills and Drill Stocks.

Blacksmiths' each.....2.00
Blacksmiths' self-feeding, each...$7.50 discount 20
Breast, P. S. & W.....discount 40 & 10
Breast, Millers Falls.....each, $3.00 dis 25
Ratchet, Weston s.....20@25
Automatic Boring Tools.....each, $1.85
Twist drills.....50&10
Morse.....50&10
Syracuse.....50&10
Standard.....50&10
Cleveland.....50&10

Drill Chucks.

Morse's Beach Patent.....each, $8.00, discount 15
Standard.....dis 25

Dripping Pans.

Sheet Iron.....large sizes 7c
Shheet Iron.....small sizes 6½c

Egg Beaters.

Dover.....per doz. $2.00
Standard.....per gross $12.00

Emery.

	No. 4 to 46 gr.	No. 54 to 150. gr.	Flour CF F. FF.
Kegs, ₱ lb	4 c	4¼c	2¾c
½ kegs, ₱ lb	4½c	4¾c	3 c
¼ kegs, ₱ lb	4¾c	5 c	3½c
10 lb cans, 10 in case	6 c	6 c	5 c
10 lb cans, less than 10	10 c	10 c	7½c

Escutch on Pins.

Iron, List Nov. 11, 1885 .....dis 50&10@50&10&5
Brass .....65@65&5

Escutcheons.

Door Lock.....Same discounts as Door Locks
Brass Thread.....dis 60
Wood.....dis 25

Files.

Rothery.....40
Nicholson.....6 &10
Black Diamond.....60&10
Royal.....75
Heller's horse shoe rasp.....dis 50&10

Faucets.

Frary's Patent Petroleum.....dis 40 &5
First Quality, Cork Lined .....40&10
Self-measuring, Enterprise, per doz $36 dis 20&10

Fly Traps.

Paragon.....₱ doz $1.75

Forks

Hay, Manure and Spading, list.....dis 65&5

Fruit and Jelly Presses.

Enterprise Mfg. Co.....dis 20&10

Fry Pr

Central Stamping Co.'s list.....dis 75

No	0	1	2	3	4	5	6	7	8
₱ doz.	$3 00	3 75	4 25	4 75	5 25	6 00	7 00	8 00	9 00

Fluting Scissors.

Discount 45

Fluting Machines

Eagle 3½-inch.....$2.15, dis 35
Geneva Hand Fluter, White Metal, ₱ doz. 12.00.....dis 25
Shepard hand. Nos. 85 $15.30. 95 $8. 110 $11 dis 40
Knox, 4½ inch rolls.....$3 25 each } dis 35
Knox, 6 inch rolls .....$3 60 each }
Crown, 4½ in. $3 50; 6-in. $4 00; 8-in. $6 50 each .....dis 35
Crown Jewel.....6-in. $3 50 each, dis 35
American, 5-in. $3; 6-in. $3 40; 7-in. $4 50 each .....dis 35
Crown hand fluter, Nos. 1 $15; 2, $12 50; 3, $10 ₱ doz .....dis 30

Gauges.

Marking .....dis 60&10
Wire.....dis 10&10

Gimlets.

Nail and Spike.....dis 50&10
Double Cut, low list.....25
"Bee".....₱ gross $12, dis 25

Glue Pots.

Tin enameled.....dis 40@
Family, Handy .....dis 45

Grindstone Fixtures.

Sargent's.....dis 70

Gun Wads.

U. M. C. & W. R. A.—B. E., 11up...2 00
U. M. C. & W. R. A.—B. E., 9&10... 2 30
U. M. C. & W. R. A.—B. E., 7&8.... 2 60
U. M. C. & W. R. A.—P. E., 11up... 3 10
U. M. C. & W. R. A.—P. E., 9&10... 4 00
U. M. C. & W. R. A.—P. E., 7&8.... 4 90
} dis 20&2

Eley's B. E., 11 up.....2 00
Eley's P. E., 11@20.....2 80

Hack Saws.

Griffin's Hack Saws, complete.....dis 40
Griffin's Hack Saw, Blades only.....dis 40
Diamond Hack Saws and Blades.....dis 25

Halters.

Jute horse and cattle ties.....$13.50 gro. net.

Hammers.

Maydole's.....discount 25@25&10
Atha new list, Jan 15, 1887.....dis 40&10@50
Magnetic Tack, No. 1, 2, 3, $1.25, $1.50 and $1.75, dis 30
Heavy hammers and sledges under 5 lbs, 36c, over 5 lbs, 30 c.....dis 70

Hand Cuffs and Leg Irons.

Providence Tool Co., hand cuffs, $15 ₱ doz...dis 10
Providence Tool Co., leg irons $25 ₱ doz.....dis 10
Tower's.....dis 15

Handles—

Door or Thumb Latches.

Per doz	Nos. 0	1	2	3	4
Sargent's	.90	1 00	1 18	1 35	1 50 dis 60&10

Roggin's Latches.....₱ doz. 30@35c
Bronze Iron Drop Latches.....₱ doz. 70c net
Jap'd store door handles—Nuts. $1 62; Plate $1 10; no plate $0 88.....net
Barn door.....₱ doz $1 80, dis 25
Wrought chest.....dis 5 & 10 & 10
Surface chest.....dis 70
Flush chest.....dis 70
Lifting.....dis 70
Saw and plane .....dis 40&10
Hammer and hatchet.....dis 25&5&2
Brad awl.....₱ gross $2
Hickory firmer chisel, assort.....₱ gross $4 50
Hickory firmer chisel, large.....₱ gross $5 00
Apple firmer chisel, assorted .....₱ gross $5 00
Apple firmer chisel, large.....₱ gross $6 00
Socket firmer chisel, assorted.....₱ gross $3 00
Socket framing chisel, assort .....₱ gross $5 00
} dis 40

File, assorted.....₱ gross $2 75
Auger, assorted.....₱ gross $5 00
Auger, large .....₱ gross $7 00
} 25

Hangers.

Barn Door, old patterns.....dis 60&10 &10
Climax (Anti-Friction).....dis 55
Star.....dis 40
Scranton.....dis 25
Kidder's.....dis 50&10
Terry's Patent, 5 in., 12.00; 3½ in., 10.00, dis 50 @
Paragon.....dis 40
Richards.....dis 20&10&10

Harness Snaps

German, new list.....dis 40&10
Covert, New Patent, new list.....dis 50&5&2

Hay Knives.

Lightning.....per doz. $11.50 net
Electric.....₱ doz $17.00 dis 30

Hinges.

Wrought Strap and T Hinges.....65&10&2@70&10
Screw, hook and strap, 8 to 12 in..... 3½@4
to 36 in..... 2¾@3
Screw hook & eye hinges...½ ₱ doz 1.50
⅝ 2.45
¾ 3.80
...dis 10
Gate, western.....₱ doz $4 40, dis 55
Gate, N. K.....₱ doz $7 00, dis 55
Gate N. E. reversible.....₱ doz $5 20, dis 55&15
Gate Clark's, Nos. 1, 2, 3.....dis 60&10@60&10&10
Gate, N. Y. State .....₱ doz $5 00, dis 55&15
Gate, automatic .....₱ doz $12 50, dis 50
Gate, common sense.....₱ doz pair $4 50, dis 50
Gate, Shepard's .....dis 60&1

Hollow-Ware.

Stove Hollow-Ware, Ground dis .....60&10&10
" " Unground .....70&10
Enameled Kettles, Saucepans .....dis 70 .....dis 40
Galvanized Tea-Kettles

Inch	6	7	8	9
Each	55	60	65	75

Hoes.

Garden, mortar.....dis 65&5
Planter's, cot.....dis 65&5
Canton.....dis 65&5

Hog Rings and Ringers.

Hill's rings $2 50
" ringers..... { Old Style.....$3 00 / Improved.....$4 50
Blair hog ringers.....₱ doz $3.00

Hooks.

Bird Cage, Sargent's list.....dis 60&10&10
Belt.....dis 75&10
Clothes Line Sargent's list.....dis 60&10
Ceiling Sargent's list.....dis 55&10
Coat and Hat, Sargent's list .....dis 55&10
Wire Coat and Hat, Gem.....dis 45
Wrought Staples and Hooks & Staples, list Jan 12, 1887.....dis 80&20
Wire Screw Hooks and Screw Eyes. dis 75&10
Hooks and Eyes—Malleable Iron.....dis 70
Hooks and Eyes—Brass.....dis 60&10&10

Horse Nails.

No.	10	9	8	7	6
Ausable, ₱ lb	23	24	25	26	28 dis 25&10 to 25&10&10
Putnam, ₱ lb	19	20	21	22	24 .....dis 15

Essex.....3½&5

Burden.....₱ keg $4.25
R. I. Horse Shoe Co., Perkins' Imp. at factory.....₱ keg $4 25
Mule Shoes, at factory.....₱ keg $5.25

Hose, Rubber, Boston Belting Co's.

Standard.....70
Extra.....55&10
Best.....45&10

Ice Picks, Chisels, &c.

Am. Ice Chisel Pol'd.....₱ doz. $3.00, dis 20

Ice Cream Freezers.

American.....50&10
Gem.....50&10
Crown.....50&10

Ice Tongs.

Champion .....₱ doz $4.00, dis 25&10
Family.....₱ doz $2.75, dis 20@25

Jack Screws.

Illinois Bolt Co. list.....dis 70

Kettles.

Brass, 7 to 17 inches inclusive.....₱ lb 22c. net.
Brass larger than 17 inches.....₱ lb 24c.
Enameled and Tea Kettles.....See Hollow Ware

Keys.

Eagle, cabinet, trunk and padlock...dis 33⅓ and

Knives.

Russell's Butcher.....net
Moran's Shoe Knives.....dis 20

Knobs.

Carriage, Japanned.....₱ gross 80c, dis 60&10
Base, Rubber Tip.....dis 70&10&5
Hemacite Door Knobs, new list.....dis 40@40&10
Door Mineral.....75c
Door Por. Jap'd 90c
Door Por. Por.....3 00@3 25
Door Por. Plated.....2 90@3 00

Ladles.

Melting, Sargent's.....dis 55&10
Melting, Monroe's Patent.₱ doz $4.00, dis 25&10
Melting, P. S. & W .....dis 25&10

Lanterns

Tubular No. 0.....$5.00 per doz
" " " 1..... 7 00
Tubular, Lift Wire, No. 0, ₱ doz..... 6 50
Tubular, Lift Wire, No. 1, ₱ doz..... 7 50
Police, Small, $6.00; Med., $7.25; Large, $9.75.....dis 20@

INDEX TO ADVERTISERS.

PAGE.

Bolts and Nuts—
Hotchkiss & Upson Co., Cleveland, O..... 10
Colwell & Collins Norway Bolt Co., Cleveland, O..... 10

Bridge Manufacturers—
Buckeye Bridge & Boiler Works, Cleveland, O..... 10

Brick and Tile Machines—
P. L. Sword & Son, Cleveland, O..... 18
Frey, Sheckler & Hoover, Bucyrus, O..... 18

Bicycles and Tricycles—
Fay Manufacturing Co., Elyria, O..... 2
J. A. Weston & Co., Syracuse, N. Y..... 10
A. W. Gump & Co., Dayton, O..... 19

Boilers—
Smith & Teachout, Cleveland, O.....10 & 20
Buckeye Bridge & Boiler Works, Cleveland, O..... 10
J. C. McNeil & Co., Akron, O..... 10
City Boiler Works, Columbus, O..... 10
Mansfield Steam Boiler Works, Mansfield, O..... 10
Reeves Bros., Niles, O..... 10
Sharon Boiler Works, Sharon Pa..... 2
Enterprise Boiler Co., Youngstown, O..... 20
Lane, Bodley & Co., Cincinnati, O..... 2
Niles Boiler Works, Niles, O..... 2
John T. Caulfield, Richmond, Ind..... 12

Bevel Jig Mills—
C. J. McNutt, Ashtabula, O..... 20

Books—
Cleveland Printing & Publishing Co., Cleveland, O..... 2&14
Rand, McNally & Co., Chicago and New York..... 12

Coal and Coke—
W. J. Rainey, Cleveland, O..... 10
Pittsburgh & Wheeling Coal Co., Cleveland, O..... 10
Andrews, Hitchcock & Co., Cleveland, O..... 10

Copying Apparatus—
Felix Daus & Co., New York..... 1

Cranes and Derricks—
Phœnix Iron Works, Cleveland, O..... 1
McMyler Manufacturing Co., Cleveland, O. 18
Wm. Tod & Co., Youngstown, O..... 20

Car Wheels—
Bowler & Co., Cleveland, O..... 17
Cleveland Wheel & Foundry Works, Cleveland, O..... 18

Catalogues—
Cleveland Printing & Publishing Co., Cleveland, O.....12 & 17

Drilling Machines—
Bickford Drill Co., Cincinnati, O..... 1
Universal Radial Drill Co., Cincinnati, O... 1
E. Gould & Eberhardt, Newark, N. J..... 2
Lodge, Davis & Co., Cincinnati, O..... 19

Engineers and Contractors—
E. H. Jones & Co. Cleveland, O..... 1
Jas. P. Witherow, Pittsburgh, Pa..... 2
Alex. Laughlin & Co., Cleveland, O..... 10

Elevators—
L. S. Graves & Co., Rochester, N. Y..... 2

Electro-Plating Machines—
Zucker & Levett Chemical Co., New York... 12

Explosives—
Hercules Powder Co., Cleveland, O..... 12

Emery Wheel Machinery—
J. Wendell Cole, M. E., Columbus, O., or Chicago Ill..... 1
Springfield Glue & Emery Wheel Co., Springfield, Mass..... 12

Engravers and Electrotypers—
Eclipse Electrotype & Engraving Co., Cleveland, O..... 10
Union Electrotype Foundry, Cleveland, O... 14
Mugler & Kraus, Cleveland, O..... 10

Finishers Seam—
Kilby Manufacturing Co., Cleveland, O..... 1
C. L. Chapman, Alliance, O..... 10
Novelty Iron Works, Canton, O..... 1
Aetna Machine Co., Warren, O..... 1
C. & G. Cooper Co., Mt. Vernon, O..... 19
Lloyd & Griffith, Erie, Pa..... 1
Wm. Tod & Co., Youngstown, O..... 20
Lane & Bodley Co., Cincinnati, O..... 2

Engines (Gas)—
Schleicher, Schumm & Co., Philadelphia, Pa., and Chicago Ill..... 19

Engineers' Specialties—
Crescent Manufacturing Co., Cleveland, O.. 14

Forges—
Cleveland City Forge & Iron Co., Cleveland, O..... 1

Foundries—
Bowler & Co., Cleveland, O.....10 & 17
Taylor & Boggs Foundry Co., Cleveland, O. 10
Wm. Fitzsimmons & Son, Cleveland, O..... 10
Curry & Co., Meadville, Pa..... 10
Cleveland Wheel & Foundry Works, Cleveland, O..... 18
Cleveland Foundry Co., Cleveland, O..... 10

Foundry Facing—
Cleveland Facing Mills, Cleveland, O..... 10

For Sale—
Foundries, Furnaces, Machinery, etc..... 14

Flue Cleaners—
Cleveland Flue Cleaner Co., Cleveland, O... 14

Files—
Reynolds Bros., Columbus, O..... 1
Industry File Works, Cleveland, O..... 10

Feed Water Heaters—
Stilwell & Bierce Manufacturing Co., Dayton, O..... 1
Laidlaw & Dunn Co., Cincinnati, O..... 18
W. C. Armstrong & Co., Springfield, O..... 19
Hoppes Manufacturing Co., Springfield, O... 20

Fire Hose—
Fabric Fire Hose Co., New York..... 2

Governors—
Leonard & McCoy, New York..... 14

Hardware—
Wm. Bingham Co., Cleveland, O..... 10 & 19
Eberhard Manufacturing Co., Cleveland, O. 10

Iron Roofing—
Sykes Iron Roofing Co., Niles, O..... 12
Cambridge Iron Roofing Co., Cambridge, O. 18
Garry Iron Roofing Co., Cleveland, O..... 18

Iron Lime Kilns—
Fred Krans, Sandusky, O..... 19

Iron Ore and Pig Iron—
Dalliba, Corrigan & Co., Cleveland, O..... 10
Tuttle, Ogilvay & Co., Cleveland, O..... 10
E. C. Pope, Cleveland, O..... 10
J. H. Outhwaite & Co., Cleveland, O..... 10
Pickands, Mather & Co., Cleveland, O..... 10
H. E. Collins & Co., Pittsburgh, Pa..... 10
Cleveland Iron Mining Co., Cleveland, O.... 10

Key-Way Cutters—
Morton Manufacturing Co., Romeo, Mich... 10

Lumber—
Fisher & Wilson Co., Cleveland, O.....10 & 19
Martin & Barris, Cleveland, O..... 10

Lathes—
Muller Machine Co., Cincinnati, O..... 1
Sebastian, May & Co., Cincinnati, O..... 19
Gage Machine Works, Waterford, N. Y..... 19
Lodge, Davis & Co., Cincinnati, O..... 2
H. L. Shepard, Cincinnati, O..... 19

Mining Machinery—
American Manufacturing, Mining & Milling Co., Cleveland, O..... 20

Machinery (General—
Machinery Manufacturers' Association, Cleveland, O..... 1
C. H. Pelsey & Co., Cleveland, O..... 18
Lane & Bodley Co., Cincinnati, O..... 2

Machine Shops—
Webster, Camp & Lane Machine Co., Akron, O..... 10
Novelty Iron Works, Canton, O..... 10

Machinists' Tools—
Wm. Gleason, Rochester, N. Y..... 10
E. E. Garvin & Co., New York..... 19

Natural Gas Burners—
Harmon, Gibbs & Co., Corry, Pa..... 10

Old Metals—
A. L. Sanger, Cleveland, O..... 10
H. E. Collins & Co., Pittsburgh, Pa..... 10

Patents—
M. D. & L. L. Leggett, Cleveland, O..... 1
Jos. A. Osborne, Cleveland, O..... 2
H. T. Fisher, Cleveland, O..... 19

Planers (Iron)—
Rochester Machine Tool Works, Rochester, N. Y..... 2

Pumps (Steam)—
Young & Locke, Titusville, Pa..... 2
John H. McGowan & Co., Cincinnati, O..... 2
Hughes Steam Pump Co., Cleveland, O..... 2
Goulds Manufacturing Co., Seneca Falls N. Y..... 10
Laidlaw & Dunn Co., Cincinnati, O..... 18

Pumps (Chain)—
S. E. Crawford, Norwalk, O..... 19

Pig and Bar Iron—
Condit, Fuller & Co., Cleveland, O..... 10
Cleveland Rolling Mill Co., Cleveland, O.... 10
W. F. Jarvis & Co., Detroit, Mich..... 10
Hussey & Pomeroy, Cleveland, O..... 10

Paint—
Iron Clad Paint Co., Cleveland, O..... 17

Railway Supplies—
Bowler & Co., Cleveland, O ..... 10 & 17
Cleveland City Forge & Iron Co., Cleveland, O..... 1
Cleveland Wheel & Foundry Works, Cleveland, O..... 18

Railroads—
Time Tables, etc..... 16

Steel Pens—
Ivison, Blakeman, Taylor & Co., New York. 19

Signs—
Weber & Lind Sign Works, Cleveland, O... 19

Safes and Locks—
National Safe & Lock Co., Cleveland, O..... 20

Stoves—
Taplin, Rice & Co., Akron, O..... 10
Cleveland Co-Operative Stove Co., Cleveland, O..... 17

Steam Boiler Inspectors—
Hartford Steam Boiler Inspection & Insurance Co., Hartford, Ct..... 2

Steam Pipe and Boiler Coverings—
John A. McConnell & Co., Pittsburgh, Pa... 18

Steel Rails, Blooms and Billets—
Cleveland Rolling Mill Co., Cleveland, O.... 10
W. F. Thornton, Cleveland, O..... 10

Saw Filers—
R. J. Schaeffer & Co., Dayton, O..... 2

Safety Water Columns—
Reliance Gauge Co., Cleveland, O..... 2

Saws—
E. C. Atkins & Co., Indianapolis, Ind..... 1

Steel Stamps and Stencils—
J. H. Fleharty & Co., Cleveland, O..... 10

Sheet Iron—
Cleveland Rolling Mill Co., Cleveland, O.... 10
Summers Bros., Struthers, O..... 10

Saw Vises—
E. C. Stearns & Co., Syracuse, N. Y..... 10

Steel Castings—
Chester Steel Casting Co., Philadelphia, Pa. 19

Steam Fitters' Supplies—
Worswick Manufacturing Co., Cleveland, O..... 19

Steel Foot Rules—
Cleveland Printing & Publishing Co., Cleveland, O..... 12

Tool Holders—
Walker Manufacturing Co., Cleveland, O... 10

Tin Cans—
W. S. Isham, Hinckley, O..... 10

Turnbuckles—
Cleveland City Forge & Iron Co, Cleveland, O..... 1

Wire Goods—
F. Powell & Co., Toledo, O..... 1
W. S. Tyler Wire Goods Co., Cleveland, O... 2

Washing Machines—
Horton Manuf'g Co., Ft. Wayne, Ind..... 1

Wood-Working Machinery—
J. S. Graham & Co., Rochester, N. Y..... 10

Wire Machinery—
John Adt & Son, New Haven, Ct..... 14

Classified List of Advertisers.

A
Andrews, Hitchcock & Co., Cleveland..... 10
Aetna Machine Co., Warren O..... 18
Armstrong, W. C. & Co., Springfield, O..... 19
American Manufacturing, Mining & Milling Co., Cleveland..... 20
Atkins, E. C. & Co., Indianapolis, Ind..... 1
Adt, John & Son, New Haven, Conn..... 14

B
Buckeye Bridge & Boiler Works, Cleveland..... 10
Bowler & Co., Cleveland..... 17
Bingham, Wm. & Co., Cleveland.....10 & 19
Bickford Drill Co., Cincinnati, O..... 1

C
Colwell & Collins Norway Bolt Co., Cleveland. 10
City Boiler Works, Columbus, O..... 10
Canfield, John T., Richmond, Ind..... 12
Cleveland Printing & Pub'g Co., Cleveland...2 & 14
Cleveland Wheel & Foundry Works, Cleveland..... 18
Canton Well Driller Co., Canton, O..... 14
Chapman, C. L., Alliance, O..... 10
Cooper, C. & G. Co., Mt. Vernon, O..... 19
Crescent Manufacturing Co., Cleveland..... 14
Curry & Co., Meadville, Pa..... 10
Cleveland Foundry Co., Cleveland..... 18
Cleveland Facing Mill, Cleveland..... 10
Cleveland Blue Printing Co., Cleveland..... 14
Cambridge Iron Roofing Co., Cambridge, O.... 18
Collins, H. E. & Co., Pittsburgh, Pa..... 10
Cleveland Iron Mining Co., Cleveland..... 10
Crawford, S. E., Norwalk, O..... 19
Condit, Fuller & Co., Cleveland..... 10
Cleveland Rolling Mill Co., Cleveland..... 10
Cleveland City Forge & Iron Co., Cleveland... 1
Cleveland Co-operative Stove Co., Cleveland. 17
Chester Steel Casting Co., Chester, Pa..... 19

D
Dalliba, Corrigan & Co., Cleveland..... 10
Daus, Felix & Co., New York..... 1

E
Enterprise Boiler Co., Youngstown, O..... 20
Eclipse Electrotype & Engraving Co., Cleveland..... 10
Eberhardt Manufacturing Co., Cleveland..... 10

F
Frey, Sheckler & Hoover, Bucyrus, O..... 18
Fay Manufacturing Co., Elyria, O..... 2
Forest City Wire & Iron Works, Cleveland.... 1
Fitzsimmons, Wm. & Son, Cleveland..... 10
Fabric Fire Hose Co., New York..... 2
Fisher & Wilson Co., Cleveland..... 18
Fisher, H. T., Cleveland..... 19
Fleharty, J. H. & Co., Cleveland..... 10

G
Gump, A. W. & Co., Dayton, O..... 19
Garry Iron Roofing Co., Cleveland..... 18
Gage Machine Works, Waterford, N. Y..... 19
Gould & Eberhardt, Newark, N. J..... 2
Graves, L. S. & Co., Rochester, N. Y..... 2
Gleason, Wm., Rochester, N. Y..... 10
Garvin, E. E. & Co., New York..... 19
Goulds Manufacturing Co., Seneca Falls, N.Y. 10
Graham, J. S. & Co., Rochester, N. Y..... 10

H
Hotchkiss & Upson Co., Cleveland..... 10
Hercules Powder Co., Cleveland..... 14
Hoppes Manufacturing Co., Springfield, O..... 20
Harmon, Gibbs & Co., Corry, Pa..... 10
Hughes Bros. Steam Pump Co., Cleveland..... 2
Hussey & Pomeroy, Cleveland..... 10
Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn..... 2
Horton Manufacturing Co., Ft. Wayne, Ind.. 19

I
Industry File Works, Cleveland..... 10
Iron Clad Paint Co., Cleveland..... 17
Ivison, Blakeman, Taylor & Co., New York.. 19
Isham, W. S., Hinkley, O..... 10

J
Jarvis, W. F. & Co., Detroit, Mich..... 10
Jones, E. H. & Co., Cleveland..... 1

K
Kilby Manufacturing Co., Cleveland..... 1
Kranz, Fred, Sandusky, O..... 19

L
Leggett, M. D. & L. L., Cleveland..... 1
Lane, Bodley & Co., Cincinnati, O..... 2
Lodge, Davis & Co., Cincinnati, O..... 19
Laughlin, Alex. & Co., Cleveland..... 10
Lloyd & Griffith, Erie, Pa..... 19
Laidlaw & Dunn, Cincinnati, O..... 18
Leonard & McCoy, New York..... 14

M
McNeil, J. C. Co., Akron, O..... 10
Mansfield Steam Boiler Works, Mansfield, O.. 10
McNutt, C. J., Ashtabula, O..... 20
McMyler Manufacturing Co., Cleveland..... 18
Mugler & Kraus, Cleveland..... 19
Morton Manufacturing Co., Romeo, Mich..... 10
Martin & Barris, Cleveland..... 10
Muller Machine Co., Cincinnati, O..... 1
Machinery Manufacturers' Association, Cleveland..... 1
McGowan, John H. Co., Cincinnati, O..... 2
McConnell, John A. & Co., Pittsburgh, Pa..... 18

N
Niles Boiler Works, Niles, O..... 20
Novelty Iron Works, Canton, O..... 10
National Safe & Lock Co., Cleveland..... 20

O
Outhwaite, J. H. & Co., Cleveland..... 10
Osborne, J. A., Cleveland..... 2

P
Pittsburgh & Wheeling Coal Co., Cleveland... 10
Phœnix Iron Works, Cleveland..... 12
Powell, F. & Co., Toledo, O..... 1
Pope, E. C., Cleveland..... 10
Pickands, Mather & Co., Cleveland..... 10
Presley, C. H., & Co., Cleveland..... 18

R
Reeves Bros., Niles, O..... 10
Rainey, W. J., Cleveland..... 10
Reynolds Bros., Columbus, O.....
Rochester Machine Tool Works, Rochester, N. Y..... 2
Reliance Gauge Co., Cleveland..... 2
Rand, McNally & Co., Chicago and New York 12

S
Sword, P. L. & Son, Cleveland..... 18
Smith & Teachout, Cleveland.....10 & 20
Sharon Boiler Works, Sharon, Pa..... 2
Schleicher, Schumm & Co., Philadelphia, Pa. and Chicago, Ill..... 19
Stilwell & Bierce Manufacturing Co., Dayton, O..... 1
Sykes Iron Roofing Co., Niles, O..... 12
Sebastian, May & Co., Cincinnati, O..... 19
Shepard, H. L., Cincinnati, O..... 19
Sanger, A. L., Cleveland..... 10
Schaeffer, R. J. & Co., Dayton, O..... 2
Summers Bros. & Co., Struthers, O..... 10
Stearns, E. C. & Co., Syracuse, N. Y..... 10
Springfield Glue & Emery Wheel Co., Springfield, Mass..... 12

T
Tod, Wm. & Co., Youngstown, O..... 20
Taylor & Boggs Foundry Co., Cleveland..... 10
Tuttle, Ogilvay & Co., Cleveland..... 10
Taplin, Rice & Co., Akron, O..... 10
Thornton, W. F., Cleveland..... 10
Tyler, W. S. Wire Goods Co., Cleveland..... 2

U
Universal Radial Drill Co., Cincinnati, O..... 1
Union Electrotype Foundry, Cleveland..... 14

W
Weston, J. A. & Co., Syracuse, N. Y..... 10
Witherow, J. P., Pittsburgh, Pa..... 2
Webster, Camp & Lane Machine Co., Akron, O 10
Weber & Lind, Cleveland..... 19
Worswick Manufacturing Co., Cleveland..... 19
Walker Manufacturing Co., Cleveland..... 10

Y
Young & Locke, Titusville, Pa..... 2

Z
Zucker & Levett Chemical Co., New York... 12

For Sale.

A 6"x10" SELF-INKING Foot Power Printing Press; will do good work. Address J. M., care Iron Trade Review, Cleveland, O. tf

For Sale.

ONE OF DUNN'S HOISTING MACHINES, with over 40 feet of chain. Good as new; capacity, 600 lbs. Address Dunn, care Iron Trade Review, Cleveland, O. tf

Furnace for Sale.

A GOOD Charcoal Iron Furnace, in Michigan. For particulars address E. C. Pope, 31 and 2 Wilshire Building, Cleveland, O. tf

For Sale Cheap.

A NEW No. 4 INJECTOR, never been used. Address Jones, care Iron Trade Review, Cleveland, O. tf

For Sale.

WE HAVE RECENTLY PURCHASED the Cleveland Iron Co.'s Rolling Mill plant on Carter street, and have for sale any or all the appliances belonging to the same. Favorable prices will be made to purchasers.
CLEVELAND ROLLING MILL CO.,
Room 12, Nat'l Bank B'ld'g,
Cleveland, Ohio.
Please mention this paper. 12tf

ENGINEERS! Don't be Humbugged.

We guarantee our A. & D. Flue Cleaners to give steam the most perfect spiral motion entire length of tubes, and do the best work.
CLEVELAND FLUE CLEANER MF'G CO.,
821y 74 Frankfort St., Cleveland, O

Engineers' Specialties.

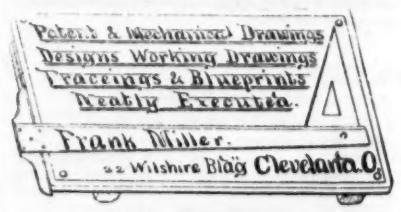
The Crescent Lubricating Compound and Automatic Grease Cups will effect a saving of 75 per cent. over oil. Investigate their merits. CRESCENT MF'G. CO.,
24 CLEVELAND, O.

FOR SALE!

To Steam Engine Builders, Shop Rights and Licenses to Build and Sell the

QUINT
Automatic Shaft Governor.

Patented Feb. 22, 1887.
Address LEONARD & McCOY,
118 Liberty St., New York



JOHN ADT & SON,

NEW HAVEN, CONN.,
BUILDERS OF
Machinery for
Straightening & Cutting Wire,
—ALSO FOR—
General Hardware Manufacturing.

Locks, Bolts, etc.

P. & F. Corbear, Locks & Bronze Goods.

Door locks, knobs and latches....dis 60
Escutcheons and keys....dis 60
Padlocks and padlock keys....dis 66⅔
Bell pulls, mineral, porcelain and jet....dis 60
Bell pulls, genuine bronze....dis 60
Lever bell pulls, genuine bronze....dis 60&10
Butts, genuine bronze....dis 60&10
Butts, bronze plated....dis 60&10
Store door locks and latches....dis 60&10
Store door handles....dis 60&10
Shutter hinges & flaps genuine bronze....dis 60&10
Shutter hinges, bronze plated....dis 70
Flush bolts, genuine bronze....dis 70
Shutter knobs, genuine bronze....dis 50
Shutter bars, genuine bronze....dis 60
Sash lifts, genuine bronze....dis 60
Sash pulls and plates, genuine bronze....dis 60
Push plates, genuine bronze....dis 60
Drawer pull genuine bronze....dis 66⅔
Letter box plates, genuine bronze....dis 60&10
Barn door locks....dis 33⅓

Lemon Squeezers.

Porcelain lined....₱ doz $6 00, dis 25&35
Wood....₱ doz $3 00, dis 5
The "Boss"....₱ doz $2.50
Dean's No. 1, ₱ doz $6 50; 2, $3 25; 3, $1 90....dis
Little giant....dis 50

Lines.

Cotton Chalk....dis 40
Silver Lake, Braided, No. 0, $6.00; No. 1, $6.50; No. 2, $7.00; No. 3, $7.50 ₱ gross....dis 25
Masons' Linen....dis 40
Wire Clothes, No 18, $3.75; No 19, $3.25; No. 20 $2.75;....

Mallets.

Hickory....dis 20&10
Lignumvitæ....dis 20&10
Penfield Block Co., Lignumvitæ and Hickory....dis 30

Mattocks.

Regular list....dis 60@60&5

Meat Cutters.

Dixon's (P.S.&W.)	1	2	3	4	
₱ doz.	$14.00	$17.00	$19.00	$30.00	dis 40
Draw Cut Nos.	5	2	6	8	10
Each	$50.00	$75.00	$80.00	$225.00	400.00

dis 20@25

Woodruff's (P S & W) per doz No 100 $15 No 150 $18 dis 45

Hale's—Nos. 11 $27, 12 $33, 13 $45....dis 70

Enterprise....dis 33⅓

Mincing Knives.

Am. (2d quality), ₱ gro, 1 blade, $7; 2 blades, $12; 3 blades, $18....net

Smith's, ₱ doz. single, $4 50; double, $6 50 dis 40

Money Drawers.

Tucker's ₱ doz....$18 @20

Molasses Gates.

Stebbins' pat....dis 70
Stebbins' genuine....dis 66⅔&10
Stebbins' tinned ends....dis 40&10
Lincoln's pattern....dis 66⅔&10
Scoville....$7 45&10

Nails (wire).

List July 14, 1887....dis 70
Standard Penny Nails, ₱ keg card rate
{ Car lots....$2 60
{ Less than car lots, $2 70

Nuts and Washers.

Size of bolt in	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4¼	4	3¾	3½
Hexagon	15¼	11⅛	8½	6	5¾	5¼	5
Washers	9	8	7	5	4¾	4½	4½

In lots less than 100 lbs, ₱ lb add ½c, 1lb boxes add 1c to list

Nut Crackers.

Table (Humason & Beckley Mfg. Co.)....dis 40
Blake's pattern....₱ doz. $2 00, dis 10
Quakenbush....$5 00 net

Oakum.

Government....₱ lb 8 c
U. S. Navy....₱ lb 7¼c
Navy....₱ lb 6½c

Oilers.

Zinc and Tin....new list dis 60&10
Brass and Copper....new list dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₱ doz....dis 10@ 10&10

Packing, Steam.

Boston Belting Co....dis 60
American Packing....10@11c
Russia Packing....16c
Italian Packing....16c

Pencils.

Faber's Carpenters'....high list, dis 50
Faber's Round Gilt....₱ gro $5.25 net

Picks.

Railroad, 5 to 6 lbs....$12 dis 60@60&5
" " 6 to 7 lbs....$13 dis 60@60&5

Pinking Irons.

₱ doz....65c. net

Picture Nails.

Brass head, Sargent's list.... } dis 50&10&10
Brass head, combination list....dis 50&10
Porcelain head Sargent's list, dis....50&10&10
Porcelain head, combination list....dis 40&10

Plane Irons.

Sandusky Tool C....dis 20&10

Pliers and Nippers.

Button's Patent....dis 40
Hall's Pat. Compound Lever Cutting Nippers. No. 2, 5 in., $13.50; No. 4, 7 in., $21 00 ₱ Doz....dis 20&10@33⅓
Gas Pliers....dis 50&10
Humason & Beckley....dis 50
P. S. & W. Tinners' Cutting Nippers add 6 per cent. dis 10

Plumbs and Levels.

Standard list....dis 70&10
Pocket levels....dis 70&10
Davis' inclinometers....dis 10&10

Post Hole and Tree Augers.

Samson Post Hole Digger, ₱ doz. $36.00, dis 20&10
Eureka Diggers....₱ doz. $15 00 @ $16.00
Champion....per doz $9.00
Vaughan's Hollow Tube Post Hole....$12.00 dis40

Potato Parers.

White Mountain....₱ doz $5.00@$5.50
American Combination....₱ doz $8.00
Hoosier....₱ doz $13.50

Pruning Hooks and Shears.

Disston's Combined Pruning Hook and Saw ₱ doz $18.00....dis 25
Disston's Pruning Hook....₱ doz $12.00 dis 25
Pruning Shears....₱ doz 3.75@$4.00 net

Pulleys.

Hot House....discount 60&10
Japanned Screw....discount 60&10
Brass Screw....discount 60&10
Japanned Side....discount 60&10
Japanned Clothes Line....discount 60&10

Pumps.

Cistern, best makers....dis 50@10&60
Pitcher spout, best makers...dis 60&10@60&10&10
Pitcher spout, cheaper goods... dis 70&5@70&10&5

Punches.

Saddlers' or Drive....₱ doz. good quality, 65@75c
Bemis & Call Co.'s Cast Steel Drive....dis 50&5
Bemis & Call Co.'s Springfield Socket....dis 50&5
Solid Tinners....₱ doz. $1.44, dis 55

Rails.

Sliding Door, Wrought Brass....₱ lb 35c dis 20
Sliding Door, Iron, Painted....₱ foot 6c dis 40&10

Rakes.

Cast Steel....dis 65&5
Malleable....dis 65&5

Razors.

J. R. Torrey Razor Co....dis 20
Wostenholme & Butcher....$10 @ £....dis 10
Rifle Razor....$9 50 net

Rivets.

Iron, Thousand, list November 17....dis 50
Iron, Ordinary, Cooper's Block and Carriage, list November 17....dis 50
Copper....dis 50

Rods.

Stair, Brass....dis 25&2

Rollers.

Barn door, Sargent's list,....dis 60&10&10
Acme (Anti-Friction)....dis 55

Rope.

Manilla ½ inch and over....11½c
Sisal, ½ inch and over....1..c

Rules.

Boxwood....discount 80@80&10

Sad Iron.

From 4 to 10 lbs....per 100 lbs 3c
Self-heating....₱ doz $9 net
Self-Heating, Tailor's....₱ doz $18 net
Mrs. Potts's Irons....dis 40&10
Enterprise Star Irons....discount 40&10

Sash Weights.

Per ton....$22.50@$25.00

Saws.

Disston's Circular....discount 45
Disston's hand panel, rip, &c....discount 25
W. M. & C., Champion Regular....per foot 23c
W. M. & C., " Thin Back....₱ ft 24c

Saw Frames.

White, Vermont....₱ gross $12 00
Red, polished & varnished ₱ doz $1.50,....dis 25

Saw Sets.

Aiken's Genuine....$13.00, dis 50 &10
Morrill Saw Sets No. 1 $15.00; No. 3 and 4 $24.00 .....dis 40 &10

Scales.

Hatch, Counter, No. 171....₱ doz $21.00
Hatch, Tea, No. 161....₱ doz $6.75@7 00
Chatillon's Grocers....dis 50
Family Turnbulls....dis 30@30&10
Scale Beams, List of January 12, 1882 dis 50&10

Scrapers.

Adjustable Box Scraper (S. R. & L. Co.) $6.50....dis 30&10
Box, 1 Handle....₱ doz $4.00, dis 10
Foot....dis 50&10

Screw Drivers.

Stanley R. & L. Co.'s Varnished Handles dis 65&10
Stanley R. & L. Co.'s Black Handles....dis 60&10
Sets Interchangeable....₱ doz $18.00 dis 25

Screws.

Wood Screws—List Jan 27, 1885.

Flat head iron	dis 70	Extra to soften given 10
Round head iron	dis 65	
Flat head brass	dis 65	
Round head brass	dis 60	
Flat head bronze	65	
Round head bronze	60	
Machine, flat head, iron		dis 55
Machine, round head, iron		50

Bench and hand—

Bench, iron	25&10
Bench, wood, beech, per dozen	$2.25
Bench, wood, hickory	20 & 10
Hand, wood	20&10
Lag or coach	dis 66⅔@70
Coach, patent gimlet point	66⅔@66⅔&5
Bed	25&5
Hand rail	66⅔&10

Saw Tools.

Atkins' patent....₱ doz sets $6 00

Shears.

American (Cast) Iron....dis 75&10
Pruning....See Pruning Hooks and Shears
Garnard's Lamp Trimmers....₱ doz $4.00
Tinners'....dis 20&2
Seymours List, Dec. 1881....dis 60 &10&5
Seymours Tailor's Shears....dis 33⅓

Scroll Saws.

Lester, complete, $10.00....dis 25
Rogers, complete, $4.00....dis 25

Sheaves.

Sliding Door R. & E. list Dec 18, 1885....dis 55&2
Sliding Door, Patent Roller....dis 60&10&2
Sliding Door, Pat'nt Roller, Hatfield's....dis 70
Sliding Door, Corbin's Anti-Friction Dec. 18, 1885 dis 60&2

Ship Tools.

L. & I. J. White....dis 20 & 5

Shovels and Tongs.

Iron Head....50&10&5
Brass Head....50

Sieves.

Metallic, new list....dis 60&10

Flour sifters { Victor....$2 00; Hunter....$2 25; Comet....$1 25

Slates.

School, by case....dis 50&5@50&10

Spoke Shaves.

Iron....dis 30
Wood....dis 30

Spoke Trimmers.

Bonney's....₱ doz $10.00 dis 50
Stearns'....₱ doz $9.00 dis 20&10

Spoons.

Basting Spoons....dis 70&10
Britannia....dis 50
Rogers Bros....dis 50&10

Squares.

Steel and iron, Nickel plated } dis 70@10&75
Disston's try square and T bevels....dis 45
Winterbottom's try and miter....dis 30&10

Steelyards.

dis 40&10@50

Stocks and Dies.

Blacksmith's....dis 35
"Lightining" screw plate....dis 15

Stone.

Hindostan, No. 1, 6c; Axe, 4½c; Slips 9c
Washita Stone....No. 1, ₱ lb 20
Turkey Oil Stone....4 to 3 in....₱ lb 40c
Turkey Slips....$1.00@1.50
Washita Slips No 1....₱ lb 37@38
Washita No 2 stone....₱ lb 15c
Arkansas Stone....2.00

Stove Boards.

Zinc....70
Oxidized....45

Shovels and Spades.

Ames' list Nov 1 1885....discount 20
Dennis....5.50
Hussey & Binns, rail road....8.00

Stove Polish.

Joseph Dixon's....₱ gross $6 00 dis 10
Gem....₱ gross 4.50 dis 10
Gold medal....₱ gross 6 00 dis 25
Rising Sun....₱ gross $5 50 net
Dixon's plumbago....₱ lb 8c. net

Trowels.

Lothrops' Brick and Plastering....dis 25
Reed's Brick and Plastering....dis 25
Disston's Brick and Plastering....dis 25
Brade's brick....dis 20

Tacks, Brads, &c.

New List, September 1, 1882. & Supplement Jan-1, 1886.

American iron carpet tacks all kinds dis. 72½&10
Steel carpet tacks all kinds....72½&10
Swedes Iron carpet tacks all kinds....72½&10
Swedes iron tacks....67½&10
Swedes iron Upholsterers' tacks....67½&10
Tinned Swedes iron tacks....67½&10
inned Swedes iron Upholsterers' tacks....67½&10
American iron cut tacks....70&10
Copper tacks....33⅓&10
Copper finishing and trunk nails....33⅓&10
Cigar box nails....45&10
Finishing nails....60&10
Hungarian nails and miners' tacks....60&10
Gimp and lace tacks....67½&10
" " " tinned....67½&10
Trunk and clout nails....60&10
Tinned trunk and clout nails....60&10
Basket nails....60&10
Chair nails....60&10
Common and patent brads....60&10
Tinned capped trunk nails....60&10

Tinware.

Stamped, Japaned & Pieced, list Jan 20, 1887....dis 70&10

Tobacco Cutters.

Enterprise Mfg. Co (Champion)....dis 20&10@30

Traps.

Game, Newhouse....dis 35
Victor....60 &10
Wood, mouse....15c ₱ doz holes
Delusion, mouse....₱ gross $18 00 dis 15

Trammel Lifters.

Wollensak's Patent....dis 50

Twine.

	BC.	P.
No. 12, Flax Twine, ¼ and ⅛ lb Balls	21½c	27c
No. 18, " " ¼ and ½ "	21½c	27c
No. 36, " " ¼ and ½ "	20c	25c
2-Ply Hemp, ¼ and ⅛ lb Balls (Spring Twine)	17	
3-Ply " 1 lb Balls	17½c	
3-Ply " 1¼ lb Balls	16c	
Cotton Wrapping, 5 Balls to lb	15@16c	

Vises.

Solid box....50&10&5@60
Parker's....discount 20@25
Prentiss...." 20 &5@25
Stephen's...." 25
Saw Filers, Wentworth's....dis 20&10
Saw filers, Stearn's....33⅓&10

Washer Cutters.

Smith's Patent....₱ doz $12 00, dis 20&10&10
Johnson's....₱ doz $11 00, dis 33⅓
Penny's....₱ doz Pol. $14 00; Jap'd. $16 00, dis 55
Appleton's....₱ doz $16 00, dis 60&10
Bonney's....dis 30&10

Well Wheels.

8 in., $2.00; 10 in., $2.50; 12 in., $3.25

Wire. New List Jan. 18, 1884

Brass and Copper....discount 20
Bright and annealed, Nos. 0 @18....dis 70&5@72½
" " Nos. 19 @ 26....dis 72½@75
" " Nos. 27 @ 36 dis 75@75&10
Coppered Nos. 0 to 18, market list....dis 65&10@70
Galvanized Nos. 0 to 18 " " dis 60&7½@65
Tinned market Nos. 0 to 18....dis 65
Cast steel....dis 50
Tinned Broom Wire....dis 70@72½
Annealed Fence, Nos. 8 and 9....dis 75
Annealed Grape, Nos. 10 to 14....dis 75
Stubs Steel Wire regular....$6 00 @ lb dis 30

Wrenches.

Coe's genuine, cash in 10 days....55 & 3
Girard Standard....discount 70&10
Agricultural....discount 5&10
Mechanics'....dis 55&10 & 3
Bemis & Call's Combination....25&10
Donohue's Engineers'....25

TINNERS' STOCK.

Tin.

Banca, Straits, English, Bar } Market excited and advancing. Quotations only on application.

Spelter.

American, cash. ₱ lb....

Charcoal Tin Plate.

IC 12x12 225 sheets....$6 00@6 50
IX 14x20 112 sheets....7 25@8 00
IC 10x14 225 sheets....₱ box 5 75@6 25
IC 20x28 112 sheets....12 25@14 00
IX 10x14 225 sheets....7 25@8 00
IX 12x12 225 sheets....7 75@8 25
For each additional X add $1.90@3.00

Coke Tin Plate.

	Best	Ordinary
IC 10x14 / IC 14x20	$5 60	

Solder.

Half and Half, in bars warranted, No. 1, Refined, Bingham } Quotations only application.

Zinc.

in c. cask....6¼
in c. open....6¾

LEAD.

Pig....5
Bar, ₱ lb....6
Pipe, ₱ lb....5½c. net
Sheet, ₱ lb....6 net
Chilled Shot ₱ bag 25 lbs....1 35

BABBIT METAL.

No. 4....6
Allens....9¼
Excelsior....15
W. B. Genuine....25

COPPER.

Lake Ingot....17
Arizona....17¾

IRON AND STEEL.

Flat Bar

1½ to 4 by ⅜ to 1 inch....1 85
4½ to 6 by ⅜ to 1 inch....1 95
1¾ to 6 by 1¼ to 2 inch....2 25
1¼ & 1⅜ by ⅝ to ¾....1 95
1 & 1⅛ by ⅝ to ¾....1 95
⅝, ¾ and ⅞ by ⅝ to ⅞....2 35

Round and Square.

1 to 1⅞ inch....1 85
2 to 2¾....2 05
2¾ to 3¼ inches....2 35
3½ to 4....2 85
4¼ to 4¾....3 35
4¾ to 5....3 55

Oval.

⅜ to 1¼ inch....2 25
⅝ to ¾....2 45
⅞....2 65
¾....3 05

Half Oval and Half Round.

1¼ to 3 inch....2 95
⅝ to 1¼....2 55
⅝ to ¾....3 05
⅞....3 35
¾....4 85

Heavy Band.

1¼ to 6 by ¼ and 5-16 inch....2 05
1 to 1⅝ by ¼ and 5-16 inch....2 15
⅜ to ⅝ by ¼ and 5-16 inch....2 35
½ to ⅝ by ¼ and 5-16 inch....2 85

Hoops.

1¼ to 4, Nos. 13 to 15....2 65
1¼ to 2, Nos. 16 to 18....2 75
1¼ to 2, No. 19....2 85
1¼ to 2, No 20....2 95
1¼ to 2, No. 21....3 05
1¼ to 2, No. 22....3 15
15-16, 1 and 1⅛, Nos. 13 to 15....2 85
15-16 1 and 1⅛, Nos. 18 to 18....2 95
1 - 6, 1 and 1⅛, Nos. 19 and 20....3 05
15- 6, 1 and 1⅛, No. 21....3 15
15-16, 1 and 1⅛, No. 22....3 35
⅞, Nos. 13 to 15....3 05
⅞ Nos. 16 to 18....3 15
⅞ Nos. 19 and 20....3 35
⅞ No. 2....3 35
⅞, No. 22....3 45
13-16 Nos. 13 to 15....3 35
13-16, Nos. 16 to 18....3 35
13-16, Nos. 19 and 20....3 45
13-16, No. 21....3 55
13-16, No 22....3 65
¾, Nos. 13 to 15....3 35
¾, Nos. 16 to 18....3 45
¾, Nos. 9 and 20....3 55
¾, No. 21....3 85
¾, No. 22....3 75
11-16, Nos. 13 to 15....3 55
11-16, Nos. 16 to 18....3 65
11-16, Nos. 19 and 20....3 75
11 16, No. 21....3 85
11-16, No, 22....3 95
⅝, Nos. 13 to 15....3 85
⅝, Nos. 16 to 18....3 95
⅝, Nos. 19 and 20....4 05
⅝ No. 21....4 15
⅝ No 22....4 25
⅝, No 23....4 35

Light Band

1¼ to 6 by ⅛ to 3-16 in....2 35
1½ to 6 by Nos 1 and 12....2 45
1 to ⅜ by ⅛ to 3-16 in....2 25
1 to 1⅝ by Nos. 11 and 12....2 55
⅜ and 13-16 by ⅛ to 3 16 in....2 75
⅜ and 13 16 by Nos. 11 and 12....2 85
¾ and 11-16 by ⅛ to 3 16 in....3 05
¾ and 11-16 by Nos. 11 and 12....3 15
⅝ and 9 16 by ⅛ to 3-16 in....3 35
⅝ and 9-16 by Nos. 11 and 12....3 45
½ by ⅛ to 3 16 in....3 60
½ by Nos. 11 and 12....3 70

Wagon Box Iron.

⅜ inch, beveled edge, by Nos. 11 and 12....2 85
⅜ inch, " " " 13 and 14....3 15
¾ inch, " " " 11 and 12....3 15
¾ inch, " " " 13 and 14....3 35

Sheet Iron.

No. 13 to 4....2 55
No. 15 to 17....2 75
No. 18 to 21....2 95
No. 22 to 24....2 95
No. 25 to 26....3 05
No. 27....3 15
No. 28....3 35

Iron Boiler Plates.

Tank, ¼ inch and heavier....2 45
C No. 1, " 2 70
C H No 1, " 2 95
C H Flange, " 3 65
Extra Flange, " 4 05
Solid Fire Box, " 4 95

Steel Boiler Plates—1 4 in. and heavier.

Tank....$2 55
Shell....3 05
Flange....3 30
Marine Flange....3 80
Fire Box....$4 45

Above includes plates 90 inches wide.
90 to 96 in. wide....¼c. lb extra.
96 to 100 in. wide....1 c. "
100 to 104 in. wide....1½c. "
104 to 116 in. wide....special.

American Cast Tool Steel.

ROUND SQUARE AND OCTAGON.	cts lb
to 2 in. inclusive	09
9 16 to ⅝ in	09
7-16 to ⅝ and 2⅛ to 3 in	10½
3⅛ to 4 in	10
⅜ to 11-16 an 4⅛	11½

TRAVELER'S RECISTER.

Standard Time.
Revised March 6th, 1888.

N. Y. C. & St. L. R. R. Co.— "The Nickel Plate."

EASTWARD.	ARRIVE.	DEPAR
Buffalo Passenger	10 40 a m	10 45 a m
Chicago Passenger	9 20 p m	
Local Freight	4 40 p m	5 45 a m
WESTWARD.	ARRIVE.	DEPART
Chicago Passenger		6 30 a m
Fostoria Passenger	4 46 p m	4 51 p m
Local Freight	5 20 p m	5 50 a m

Rocky River Accommodation departs 7:40 a. m.; 1: 0 p. m.
Euclid Accommodation departs 6:24 a. m. 12:10 a. m., 5: 5 p. m.
All trains daily, except Sunday.

Cleveland & Pittsburg.

	ARRIVE.	DEPART.
New York Express	12 45 p m	7 45 a m
New York Express	6 55 p m	1 40 p m
Alliance & Akron Accom.	9 35 a m	3 25 p m
Ravenna Accommodation	8 25 a m	5 00 p m
Night Express	* 5 25 a m	*11 10 p m

*Daily; all other trains daily except Sunday.

Mt. Vernon & Pan Handle Route

C., A. & C. Ry. Co.	ARRIVE.	DEPART.
Akron, Col. & Cin. "Flyer"	5 40 p m	8 10 a m
Akron, Col' & Cin. Night Express	7 30 a m	8 00 p m
Akron & Columbus Exp.	12 45 p m	1 40 p m
Akron & Orrville Accom.	9 35 a m	3 25 p m

The 8 p. m train runs daily. Elegant Pullman palace sleeping cars attached. All other trains daily except Sunday.

Erie Railway.
Depot. South Water st. and Viaduct.

	ARRIVE.	DEPART.
N. Y. & Pitts. Express	15 38 a m	*8 25 a m
Fast N. Y. & Pitts. Express	*10 55 a m	*3 00 p m
Mahoning Accommodation		†6 40 a m
Pittsburgh Express	†6 25 p m	
Youngstown Local	†8 05 a m	
Mahoning div and Pitts Local		*11 40 a m
Mahoning Val Accom		*4 30 p m
Pittsburgh Express	†1 20 p m	11 10 p m
New York Express	*8 00 p m	

* Daily. † Daily except Sunday. ‡ Daily except Monday.

Lake Snore & Michigan Southern Railroad.

TRAINS GOING EAST.	Arrive	Depart
No. 4, Fast Limited Ex	2 55 a m	*2 55 a m
No. 6, N. Y. & Bos. Ex	*1 55 a m	*1 40 a m
No 8, N. Y., B't'p & At Ex	*8 25 a m	*8 50 a m
No. 26, Elyria Accom	†7 45 a m	
No. 10, Toledo & Sandusky Accommodati n	†1 05 a m	
No. 24, Buffalo Accom		†7 00 a m
No. 10, N. Y. & Boston "Flyer."		*11 50 a m
No. 12, N. Y. & Bos. Ex.	*2 35 p m	*3 00 p m
No. 2 Night Express	†9 40 p m	†10 00 p m
No 26, Conneaut Accom		†4 25 p m
TRAINS GOING WEST.	Arrive from East.	Depart West.
No. 1, Fast Limited Ex	*12 15 a m	*12 15 a m
No. 23, Cleveland Express	*2 15 a m	
No. 3 Chi Ex. via Sand'y	15 30 a m	†5 45 a m
No. 25, Mich. Ac. via Norw'k		†5 45 a m
No. 21, Toledo Ex. via Norwalk and Sandusky	†12 50 p m	†3 20 p m
No. 5, Fast St. Louis & Chicago Ex. via Sandusky	*10 50 a m	*10 55 a m
No. 9 hi. Pac. Ex via Nor'k	*6 55 p m	*7 15 p m
No. 31, Elyria Accommodation, to Elyria only		†4 30 p m
No. 27, Conneaut Accom	*8 10 a m	

Sunday train for Nottingham—Depart 8:15 a. m. and 1:10 p. m.; arrive 9:20 a. m. and 4:45 p m.
Reference marks—*Daily. †Daily except Sunday. ‡Daily except Monday.
A local Cleveland and New York Sleeper and dining car daily on No. 10, leaving Cleveland at 11:50 a. m., arrives Grand Central Depot, New York 7:30 a. m.
For further information as to trains, connections and sleeping car berths apply at the City Ticket Office 229 Bank St., Mercantile Bank building Telephone 669.

M. E. GAUL, City Pass. Ag't. A. J. SMITH, Gen'l Pass. & Ticket Ag't.

Cleveland and Canton Railroad.

Arrive.—Canton, Sherrodsville and Coshocton 9 55 a.m., 7 00 p.m.
Kent —*7 50 a.m., *7 16 p.m.
Bedford—*7:50 a.m., 1:05 p.m., 7 16 p.m.
Newburgh and Miles avenue—7:10 a.m., 4:15 p.m. 5:33 p.m.
Depart—
Canton, Sher'dsville & Cosh't'n—7:00 a.m. and 3:10 p.m.
Kent—*8:38 a.m. and *8:30 p.m.
Bedford—*8:38 a.m., 4:45 p.m., 11:10 a.m., 5:45 p.m.
Newburgh and Miles Avenue—6:12 a.m., 2:00 p.m., 4:40 p.m.
Trains marked with * run daily. All other daily except Sunday.
Depot at Ontario street, one square north of Huron street.

Cleveland, Lorain and Wheeling.

	DEPART.	ARRIVE
Wheeling Express	6 45 p m	6 55 p m
Ubrichsville Express	4 00 p m	9 20 a m

Pittsburgh & Lake Erie Railroad

On and after Jan. 2 1888, passenger trains will depart from and arrive at the Pittsburgh and Lake Erie Depot at Pittsburgh, as follows. Central time:

P. & L. E. R. R. Depart for—

No. 1, Cleveland, Bradford and East..... 5 25 a.m
No. 5, Buffalo, St. Louis, Cleveland..... 7 45 a.m
No. 5, Beaver Falls Accommodation..... 8 40 a.m
No. 7, Buffalo, New York, and all New England points..... 10 15 a.m
No. 9, Chicago, Cincinnati, St. Louis,... 1 10 p.m
No. 11, Buffalo Express..... 3 30 p.m
No. 13, Beaver Falls Accommodation..... 5 20 p.m
No. 15, Buffalo Express..... 10 30 p m

Arrive from—

No. 2 Beaver Falls Accommodation..... 5 25 a.m
No. 4, Buffalo and Cleveland Night Exp. 6 55 a.m
No. 6, Youngstown Accommodation..... 9 20 a.m
No 8 Beaver Falls Accommodation..... 12 40 p m
No. 10, Chicago, Cincinnati & St. Louis, 1 35 p.m
No. 12, Buffalo Express..... 5 45 p.m
No. 14, Cincin. St Louis and Cleveland, 8 05 p.m
No. 14, Cleveland & Buffalo Express..... 10 3 p.m

Pittsburgh & Lake Erie trains Nos. 4, 15, 8 and 10 daily.

E. HOLBROOK, General Superintendent.
R. W. JONES, Master of Transportation.
A. D. SMITH, Gen'l Pass. Ag't, Pittsburgh.

WHEELING & LAKE ERIE

TIME TABLE—IN EFFECT JAN. 8, 1888.
Central Standard Time.

EASTWARD.	No. 5.	No. 7.	No. 9.*	No. 13*
Toledo.....lv	7 45 AM	1 10 PM	4 50 PM	7 45 PM
Oak Harbor...ar	8 43	2 05	5 45	10 0
Fremont	9 06	2 30	6 10	1 45
Clyde	9 22	2 47	6 25	11 15
Bellevue	9 37	3 03	6 40	11 40 PM
Monroeville...lv	9 55	3 20	6 58	3 10 AM
Norwalk	10 10	3 40	7 15	3 22
Wellington	11 00	4 32	8 08	4 00
Creston	11 53	5 20	9 05 PM	4 47
Orrville.....ar	12 20 PM	5 48	9 40 PM	5 15*
Orrville.....lv	12 40	5 53	7 05 AM	7 05
Massillon.....ar	1 20	6 35	7 52	7 52
Massillon.....lv	1 20	6 35	7 52	7 52
Navarre	1 35	6 50	8 10	8 10
Valley June.lv	2 10	7 35	8 55	8 55
New Cumberl'd	2 23	7 48	9 10	9 10
Sherrodsville	2 45	8 00	9 25	9 25
Leesville	2 57	8 18	9 40	9 40
Bowerston....ar	3 58PM	8 15PM	9 50AM	9 50AM
Canal Dover	3 57 PM			
New Comerst'n	3 8			
Cambridge	4 35			
Macksburg	6 02			
Marietta.....ar	7 15 PM			

WESTWARD.	No. 6.	No. 8	No. 4.	No. 2.*
Marietta.....lv	6 45 AM	2 20 PM		
Macksburg	7 5	1 30		
Cambridge	9 23	3 00		
New Comerst'n	10 23	3 58		
Canal Dover	11 04 AM	4 34PM		
Bowerston	1 25 AM	3 45PM	9 55 AM	
Leesville	11 32	3 55	6 02	
Sherrodsville	11 40	4 10	6 10	
New Cumberl'd	11 52	4 25	6 22	
Valley June	12 20 PM	5 02	6 45	
Navarre	12 50	5 35	7 35	
Massillon	1 05	5 50	8 00	
Orrville.....ar	1 40	6 25	8 55	
Orrville.....lv	1 45	6 35*	9 13	
Creston	2 18	7 02	9 42	
Wellington	3 05	7 43	10 33	
Norwalk	3 55	8 25	11 30	7 25 AM
Monroeville	4 07	8 35	11 45	7 35
Bellevue	4 23	9 45	11 59	7 51
Clyde	4 39	10 00	12 15 PM	8 06
Fremont	4 55	10 17	12 30	8 23
Oak Harbor	5 20		12 53	8 45
Toledo.....ar	6 20 PM	11 15*	1 50 PM	9 40 AM

No 7	No 23	Huron Division	No 9*	No 8
4 55 PM	7 40 AM	Ar. Huron Lv	8 55 AM	5 30 PM
4 32	7 22	Friese Landing	9 10	5 45
4 20	7 10	Milan	9 28	6 03
Lv 3 5	Lv 6 45	Norwalk	Ar 9 35	Ar 6 30
Ar PM	Ar AM	Monroeville	Lv AM	Lv AM

* Daily.
Train No. 13 leaves Toledo *7 45 p. m.; arrive Monroeville 12 10 a. m and Norwalk 12 35 a. m
This road is now open through from Toledo to Bowerston, connecting with the Pennsylvania System for all points East.

THROUGH CAR SERVICE.

Between Toledo, Cambridge and Marietta.
" " and Bowerston
" " and Akron, Youngstown and Pittsburgh.
" Chicago, Akron, Youngstown and Pittsburgh.

M. D. WOODFORD, Gen'l Manager. JAMES M. HALL Gen'l Pass. Agt.

Scioto Valley Railway

TIME TABLE.
In effect May 27, 1888.

THE SHORT LINE TO ALL POINTS

North and South, East and Southeast, West and Northwest.

TRAINS GOING SOUTH

STATIONS.	No. 2.	No. 4.	No. 6.
Columbus.....Lv	7 10 a.m	11 25 a m	5 45 p.m
Valley Crossing	7 30 "	11 44 "	5 45 "
Lockbourne	7 41 "	11 53 "	5 56 "
Ashville	7 55 "	12 07 p.m	6 10 "
Circleville	8 15 "	12 26 "	6 30 "
Kingston	8 34 "	12 44 "	6 49 "
Chillicothe	9 01 "	1 30 "	7 35 "
Sharon	9 36 "	2 05 "	8 10 "
Waverly	9 46 "	2 14 "	8 20 "
Piketon	9 58 "	2 27 "	8 33 "
Big Run	10 12 "	2 41 "	8 47 "
Lucasville	10 27 "	2 57 "	9 03 "
Portsmouth	10 50 "	3 20 "	9 25 "
Scioto ville	11 05 "	3 35 "	9 40 "
Wheelersburg	11 10 "	3 40 "	9 45 "
Havernill	11 29 "	3 59 "	10 04 "
Hanging Rock	11 40 "	4 10 "	10 15 "
Ironton	11 50 "	4 20 "	10 25 "
Petersburg	12 00 m.	4 30 "	10 35 "
Ashland.....Ar	12 30 p m	5 00 p.m	11 05 p.m

Trains Nos. 2 and 4 daily, except Sunday.
Train No. 6 daily.
Train No. 6 takes supper at Chillicothe.

TRAINS GOING NORTH

STATIONS.	No. 1.	No. 3.	No. 5.
Ashland.....Lv	2 46 a.m	9 05 a.m	5 35 p.m
Petersburg	3 15 "	9 35 "	6 05 "
Ironton	3 26 "	9 6 "	6 15 "
Hanging Rock	3 36 "	9 56 "	6 25 "
Havernill	3 46 "	10 07 "	6 35 "
Wheelersburg	4 06 "	10 28 "	6 55 "
Scioto ville	4 12 "	10 33 "	7 00 "
Portsmouth	4 27 "	10 05 "	7 15 "
Lucasville	4 49 "	11 14 "	7 37 "
Big Run	5 04 "	11 32 "	7 53 "
Piketon	5 18 "	11 48 "	8 07 "
Waverly	5 30 "	12 01 p.m	8 20 "
Sharon	5 40 "	12 11 "	8 30 "
Chillicothe	6 35 "	1 10 "	9 06 "
Kingston	7 01 "	1 26 "	9 31 "
Circleville	7 20 "	1 36 "	9 49 "
Ashville	7 40 "	1 55 "	10 08 "
Lockbourne	7 55 "	2 15 "	10 22 "
Valley Crossing	8 08 "	2 39 "	10 31 "
Columbus.....Ar	8 20 a.m	3 00 p.m	10 50 p.m

Train No. 1 daily.
Trains Nos. 3 and 5 daily, except Sunday.

COUPON TICKETS, by the best routes and to all principal points in the United States and Canada, can be found at the following Stations: Columbus, Circleville, Kingston, Chillicothe Waverly, Portsmouth, Ironton, A. C. & I. Ashland.

For further information relative to rates, connections and through time, call on your Ticket Agent, or address J. ROBINSON, Receiver.

JNO. J. ARCHER, Gen'l Pass. & Ticket Ag't, Columbus, Ohio.

Ft. Wayne, Cincinnati & Louisville RAILROAD.

THE POPULAR ROUTE

BETWEEN THE

NORTH and SOUTH

THE DIRECT ROUTE TO OR FROM
FORT WAYNE,
INDIANAPOLIS,
TERRE HAUTE,
EVANSVILLE,
AND ST. LOUIS.

13 MILES SHORTER —BETWEEN— 13

Fort Wayne and Indianapolis

Than any other Route.

22 MILES SHORTER AND QUICKER 22

By 3 HOURS, Between

Louisville and Fort Wayne.

Ask for Tickets
—VIA—
Ft. Wayne, Cincinnati & Louisville Railroad.

For sale by all Agents of connecting lines, EAST, WEST, NORTH AND SOUTH.

W. W. WORTHINGTON, Gen'l Supt. S. A. WIKEL, Gen'l Ticket Agent.
FORT WAYNE, IND.

The Picturesque Lehigh Valley Route.

Two through trains with Pullman cars attached are now run via by this beautiful scenic route, between Suspension Bridge, Buffalo, New York and Philadelphia, leaving Suspension Bridge 8:35 A. M. and 3:40 P. M., Buffalo 9:15 A. M. and 5:15 P. M., connecting with all trains from the West.

Passengers between the East and West passing over the famed LEHIGH VALLEY ROAD will experience the pleasure of a trip through the most magnificent and picturesque scenery in the world, presenting an ever varying panorama of delightful surprises.

Double track, steel rails, magnificent road bed and unrivaled equipment, all combine to make the LEHIGH VALLEY the favorite and most desirable route between the East and the West.

Anthracite Coal is used entirely, guaranteeing the passengers perfect freedom from the dense volumes of smoke that so greatly annoy passengers on lines using Bituminous Coal.

E. B. BYINGTON, Gen'l Pass. Agent Bethlehem, Pa.

Expiration Registers.

MANUFACTURERS' and Dealers' Insurance Registers with special ruling for number of Policy, Company, seven spaces for amounts on different property, amount of policy, amount of premiums, time of expiration, etc., will be sent post-paid on receipt of $1 00. Or we will give one as a premium with each new subscription to the IRON TRADE REVIEW, price $3.00 per year.

Address,

Cleveland Printing and Publishing Co.

Cleveland, Ohio.

Detroit & Cleveland

STEAM NAVIGATION CO.

Week Days **FOR DETROIT** 9.00 P. M.

Special Sunday Night and Thursday Morning Trips, July and August.

Four Trips **For Mackinac** per Week,

and Lake Huron Way ports.

All Departures from 23 River Street.

E. B. WHITCOMB, G. P. A. T. F. NEWMAN, G. A

VALLEY RAILWAY.

Depot foot South Water Street

	Arrive.	Depart.
Valley Junction Mail	*7 30 a m	*7 50 p m
Marietta Express	† 1 00 a m	†5 5 p m
Canal Dover Express	* 4 0 p m	*10 00 a m
Akron & Cleve. Accom	* 7 45 p m	*7 35 a m

*Daily
†Daily except Sunday.

WM. THORNBURGH, Gen. Manager. R. A. CARRAN, Gen. Pass. Ag't.

ERIE RAILWAY.

THE FAVORITE

AND

Picturesque Route

TO

New York, Boston and the East.

THE SHORTEST AND QUICKEST ROUTE TO PITTSBURGH, WASHINGTON AND BALTIMORE, AND THE SOUTHEAST.

Change of time goes into effect May 20, 1888.

Central, or Ninetieth Meridian time, 33 minutes slower than Cleveland city time.

Until further notice trains will leave from the New Central Depot, South Water Street and Viaduct, as follows:

	Depart.
No. 62, Mahoning Valley Accommo	† 6 40 a m
No 72, New York Express,	* 8 30 a m
No. 72, Fast Pittsburgh Express	* 8 30 a m
No. 64, Fast New York Express	* 3 00 p m
No. 64, Pittsburgh Express	* 3 00 p m
No. 66, Youngstown Accommo	* 5 00 p m
No. 68, Pittsburgh Express	†11 10 p m
No. 68, New York Express	†11 10 p m
No. 70, Pittsburgh Local Express	*11 40 a m
No. 74, Shenango Valley Express	† 4 40 p m
	Arrive.
No. 73, Shenango Valley Express	† 9 25 a m
No. 61, New York Express	† 5 45 a m
No. 61, Pittsburgh Express	† 5 45 a m
No. 65, Fast New York Express	*10 55 a m
No. 65, Pittsburgh Express	*10 55 a m
No. 67, Pittsburgh Express	† 1 20 p m
No. 63, New York Express	* 7 05 p m
No. 69, Pittsburgh Express	* 8 45 p m
No. 77, Youngstown Local	* 7 25 a m

No. 13, Erie Express, carrying express matter only, from all points East and South-east, carries no passengers (except Monday) † 1 20 p m.

* Daily † Daily, except Sunday.

☞ This is the only route by which passengers can reach Corry, Elmira, Binghampton, New York City and intermediate points without change. No change to Boston and New England cities.

Baggage checked through to all points East.

Through tickets and information regarding the route can be obtained at office, 141 Superior street, and at Central Depot, South Water street and Viaduct, Cleveland. Ship by Erie Express.

E. B. THOMAS, 2d Vice President, Cleveland, O.
L. P. FARMER, Gen'l Pass. Agent, New York.
W. C. RINEARSON, Ass't G. P. A., Cincinnati, O
M. L. FOUTS, City Passenger Agent, 141 Superior Street, Weddell House, Cleveland, O.

Cleveland & Marietta R. R.

THROUGH LINE BETWEEN

Marietta, Caldwell, Cambridge, Newcomerstown, Canal Dover, Canton, Akron, Cleveland, Buffalo Toledo Pittsburgh, New York, Coshocton, Newark Zanesville, Columbus, Chicago and St. Louis.

In effect April 22d, 1888.

GOING NORTH.			GOING SOUTH.	
No. 4.	No. 2.	STATIONS.	No. 1	No. 3.
9 55 AM	2 00 AM	Parkersburg	2 45 P	1 55 AM
12 20 PM	6 45	Marietta	10 15 AM	7 13
12 40	7 05	Caywood	9 55	6 53
12 48	7 11	Stanley	9 49	6 47
1 00	7 25	Whipple	35	6 32
1 10	7 35	Warner	9 25	6 22
1 23	7 48	Elba	9 12	6 09
1 30	7 55	Macksburg	9 05	6 02
1 37	8 01	Dexter City	8 58	5 55
1 41	8 05	South Olive	8 54	5 50
1 48	8 12	Dudley	8 47	5 43
1 57	8 20	Caldwell	8 40	5 36
2 07	8 0	Belle Valley	8 30	5 26
2 17	8 40	Ava	8 19	5 14
2 29	8 52	Pt. Pleasant	8 07	5 04
2 44	9 01	Byesville	7 53	4 50
3 00	9 25	Cambridge	7 36	4 35
3 07	9 32	Oltham's	7 27	4 27
3 14	9 40	Millers	7 20	4 20
3 24	9 50	Kimbolton	7 10	4 10
3 29	10 05	Guernsey	6 56	3 55
3 47	10 14	Post Boy	6 49	3 47
3 58	10 23	N. Comerstown	6 40	3 38
4 05	10 0	Wolf's	6 31	3 29
4 17	10 43	Phillipsburg	6 20	3 17
4 22	10 48	Back Band	6 14	3 12
4 28	10 54	Turner's	6 09	3 06
4 48	11 04	Canal Dover	6 00 AM	2 57
5 00	11 27	ar. Vall'y J'n. lv		2 35
5 02	1 35	lv. Val'y J'n. ar		2 20
	12 19 PM	Canton		1 30
	1 02	Akron		12 31
	2 30	Cleveland		11 20 A
	8 00	Buffalo		5 40
11 15 PM	6 20	Toledo		7 05

Train No. 8 leaves Marietta at 1 40 p. m. Whipple 2 40, Warner 3 00, Elba 3 20, Macksburg 3 35, Dexter City 3 47, Caldwell 4 25, arriving Cambridge 6 30 p m. Train No. 5 leaves Valley Junction at 5 1 p. m., arriving at Canal Dover 5 50 p m

Through coaches on trains Nos. 2 and 3 between Marietta, Canton, Akron, Cleveland and Toledo. Close connections made at Marietta with C., W. & B., M. C. & N., Z. & W. O., and Ohio River Packet; at Cambridge with B. & O., east and west; at Newcomers own with P., C. & St. L., east and West; at Canal Dover with C., L. & W. and C. & P., north and east; at Valley Junction with W. & L. E. and Valley R'y.

W. K. RICHARDS, Gen. Pass. Agt

A. T. WICKOFF, Gen. Manager.

½ to 6 in.	11½
¼ to 9-32 and ⅛ to 7 in.	12
3-6 in.	14

Flats.

	cts. lb
2 to 9-16 wide by 2 to ⅝ thick	0

Bessemer and O. H. Steel.

	cts. lb.
Machinery base price.	0
Tire	02½
Spring	03¼
Sleigh Shoe	02¾
Toe Calk	03
Cutter Shoes, tapered and barr	03

For extra sizes, see classification below.

Machinery Steel.

ROUNDS AND SQUARES.

	cts. per lb ex.
1 to 3 in. incl.	base
3⅛ to 4 "	0.3
4⅛ to 6 "	1.0
⅜ to 15 16 "	0.2
¼ to 11-16 "	0.3
⅝ to 7-16 "	0.4
5-16 to 11-32 "	0.5
¼ and 9-32 "	0.7
Machine cutting, specified lengths, ab'e 24 in.	0.2
Machine cutting, specified lengths, 1 to 24 in.	0.4

Machine cutting to specified lengths less than 12 inches, according to contract, but not less than 0.8 cents on each size extra. Sawing, one-half of the above extra for cutting.

FLATS. cts. per lb ex.

1½ to 6 in., by 5-16 to 1 in. thick	base
1½ to 6 in., by ½ and 9 32 in. thick	0.2
1½ to 6 in., by 3 16 and 7-32 in. thick	0.3
1½ to 6 in . by ⅛ and 5-32 in. thick	0.4
⅜ to 1 7-16 in., by ¼ to 1 in. thick	0.3
⅜ to 1 7-16 in., by 3-16 and 7-32 in. thick	0.4
⅜ to 1 7-16 in., by ⅛ and 5 32 in. thick	0.5
⅝ to 11-16 in., by ¼ to ½ in. thick	0.4
⅝ to 11-16 in., by 3-16 and 7-32 in. thick	0.6
⅝ to 11 16 in., by ⅛ and 5-32 in. thick	0.8
⅝ to ¾ in., by 1-16 and 3-32 in. thick	2.0
13-16 to 1¼ in., by 1.16 and 3- 2 in. thick	1.5
1¼ to 3 in., by 1-16 and 3-32 in. thick	1.0

These extras apply on Tire, Toe Calk, Shoe and Flat Machinery Steel, also on Cutter Shoes.

SPRING STEEL FLATS. cts. ex.

1¼ to 4 in. by No. 4 gauge to ⅛ in. inclusive,	base
1 and 1⅛ in. by No. 1 gauge to 4 gauge "	0.2
1 to 3 in by No. 5 gauge to 7 gauge "	0.5
¾ to 3 in. by No. 8 gauge to 10 gauge "	1.0
¾ to 3 in. by No. 11 gauge to 16 gauge "	2.0
¾ to 3 in, by No. 17 gauge to 20 gauge "	3.5
⅜ to ⅝ in. by No. 10 gauge to 16 gauge "	4.0
⅜ to ⅝ in. by No. 17 gauge to 20 gauge "	5.0
⅜ to ⅝ in. by No. 21 gauge to 24 gauge "	6.0

Bessemer and Open Hearth cut to length, 24 inch and over 1-10 cent per lb. extra, and under, by special contract.

ROUND SPRING STEEL. cts. ex

⅝ to 1½ inches	base
¼ to 9-16 inches	0.2
⅜ to 7-16 inches	0.5
5-16 inches	1.0
¼ inches	1-5

English Tool Steel.

Jessops	16c
Hob on's "Best"	16c
" "Choice"	36c

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter	4 00
Bridge ½, ⅝, 11-16 and ¾ inch diam	4 00

Rolls and Castings.

Furnace floor and straightening plates	1¼c
Housings and castings not otherwise specified	1¾c
Guide plates	2¼c
Spindles and coupling boxes	1¾c
Sand rolls and pinions, large size	2 c
Sand rolls and pinions, small size	2¼c
Pipe mill castings	3 c
Rolling mill castings under 50lb	2 c
Spur and bevel wheels, large	3 c
Spur and bevel wheels, small	3½c
Pulleys up to 30 inches	4 c
Pulleys over 30 inches	3½c
Engine castings, light	3¼c
Engine castings, heavy	2¾c

SCRAP IRON AND OLD METAL

	Net Ton.
No. 1 R. R. wrought scrap	$23 00
No. 1 wrought scrap	20 00
No. 1 Machine cast scrap	15 00
Stove plate (free from burnt iron)	10 50
Grate bars	11 00
Pipes and flues (Clean)	13 00
Tank iron	12 50
Hoop and band iron	10 00
Iron axles	28 00
Light sheet iron	10 00
Axle turnings	16 00
Wrought turning (free from cast)	15 00
Wrought iron, oily drillings	14 00
Cast borings	11 00
Malleable iron	10 50
Uncut wrought iron boilers	10 00
Steel boiler plates	14 50
Old iron T rails	gross tons $27 00
Old steel rails	23 00
Car wheels	20 00
Old copper per lb	7
No. 1. H. red Brass	8¼
Heavy yellow brass	6¼
Light yellow Brass	6
Scrap Zinc	3
Tea Lead	3
Heavy Lead	3¼

WROUGHT IRON PIPE.

DISCOUNTS.

	Discount Per Ct.
Wrought iron pipe: Butt black X str	
XX str	50
Wrought iron pipe. Lap black X str	
XX str	60
Wrought iron pipe: Butt galv	40
" " Lap "	50
Lap-welded boiler tubes	50
" drive pipe	
" casing	
Lead pipe per lb	
Sheet lead "	
Galvanized spiral pipe	50
" " fittings	30
Patent adjustable ells	40
Globe ventilators	60
Tin tubing	50
Fittings for same	30
Expanding conductor pipe and fittings	40
Cast iron piece fittings for wrought iron pipe, black and galv	70
Bushings and plugs	75
Malleable unions	65
" flange unions	72½
Long screws	70
Gas pipe hooks	50
Cast iron flanges, manifolds and expansion pipe hangers	65
Hook, ring and expansion plates, coil stands	67½
Iron body: Globe, angle, check, cross, safety, butterfly, throttle, back pressure and foot valves	65&10
Iron body: Expansion joints and iron cocks, all iron	65&10
Iron body: Iron cocks with brass plugs	65&10
Straight way valves	
Brass: Globe, angle, check, cross safety, and radiator valves	60&10
Turottle and butterfly valves	5 &10
Brass: Fin. globe valves, with finished brass wheels	40&10
Brass: Steam, service, meter and union meter cocks	57½&10
Brass: Expansion joints and steam bibbs	50&10
Mississippi gauge cocks	55
Bingham "	30
Gas proving pumps	50
Oil cups, lubricators and air cocks	60&10
Cocks for steam gauges	60&10
Cylinder cocks	50&10
Comp. gauge cocks	55&10
Water gauges, steam whistles and whistle valves	60&10
Gas fixture fittings	55
McNamara hydrants and street washers	Spec'l
Stop cock boxes	Spec'l
Galvanized wrought iron range boilers, to 52 gallons	65
Galvanized wrought iron range boilers, larger	50
Stands for same	45
Copper bath tubs	25
Closets	Spec'l
Cast iron soil pipe, to 6 in. inclusive	60
" " fittings, to 6 in. inclusive	65
Cast iron sinks	70
" slop sinks	60
Drive-well points	50
Ground key work:	
Rough and fin. plain, tray and bath bibbs, " " stops, shower stops, hydrant and ball cocks	55&10
Compression:	
Rough and fin. plain, tray and bath bibbs	50&10
" " stops; urinal, hopper, hydrant and ball cocks	50&10
Basin cocks, from No 1 to 13 inclusive	50&10
" " above No. 13, and double basin	40&10
Shampooning and sink cocks	40&10
Pantry cocks	50&10
Shampooning sprinklers	50&10
Double bath cocks and chain stays	50&10
Hose goods, plain and water back couplings	55&10
Boiler couplings, ground face, per set net, $1.25	10
Boiler couplings plain face, per set net, $1.20	10
Basin plugs and grates; bath, sink and wash tray plugs	60&10
Soldering nipples and unions	60&10
Union joints	60&10
End ferrules; street washer screws, checks and guides	55&10
Hydrant and basin clamps, hydrant sockets	55&10
Pipe taps, reamers and dies	60
Plain pipe tongs and gas pipers	50
Wrenches: Coe	50 & 5
" Girard agricultural	65
" " standard	60 & 5
" Stillson	33⅓
" Armstrong	25 & 5
" Bemis & Call	25 & 5
" Rouse	30
" Bauer s	10
Pipe tongs: Brown's adjustable	50
" Jarecki	50
" Robbins' chain	10
" Brock's	10
Vises: Plain pipe	55
" Smith comb	50
" Parker's comb	50
" Bauer s pipe and bolt	10
Machinists' hammers	40
Copper "	Spec'l
Pipe cutters: Stanwood	20
" Eureka	45
" Saunders	40
" Barnes	50 & 5
Malleable oilers and hand lamps	Spec'l
Screwing stocks	60
Armstrong s adjustable stocks and dies	25&10
Waste, at manufacturer's prices.	
Gas fitters' cement	Spec'l
Hair felt	Spec'l
Riley Bros. cement	Spec'l
Otley Bros. steam packing	Spec'l
Mineral wool	Spec'l
Lubricating compound	Spec'l
Malleable iron fittings, black and galv	25
Wrought iron couplings and nipples, black and galv	70

Standard Wrought Iron, Steam, Gas and Water Pipe.

Nominal Size Inside Diameter.	Price per Foot, Black	Price per Foot, Galvanized.	Thickness.	Nominal Weight per Foot.	No. of Threads per in. of Screw.	Price, Extra Threads.
In.			In.	Lbs.		
⅛	0 04	0 05	.068	0 24	27	0 05
¼	0 04	0 05	.088	0 42	18	0 05
⅜	0 04	0 05½	.091	0 56	18	0 05
½	0 05	0 07	.109	0 84	14	0 05
¾	0 07	0 09	.113	1 12	14	0 05
1	0 09½	0 12½	.134	1 67	11½	0 06
1¼	0 12½	0 17	.140	2 24	11½	0 07
1½	0 22	0 25	.145	2 68	11½	0 08
2	0 28	0 32	.154	3 61	11½	0 10
2½	0 44	0 49	.204	5 74	8	0 15
3	0 58	0 64	.217	7 54	8	0 20
3½	0 70	0 86	.226	9 00	8	0 25
4	0 85	1 00	.237	10 66	8	0 35
4½	1 00	1 25	.246	12 49	8	0 45
5	1 20	1 50	.259	14 50	8	0 55
6	1 65	2 00	.280	18 76	8	0 70
7	2 00		.301	23 27	8	0 85
8	2 75		.322	28 18	8	1 00
9	3 70		.344	33 70	8	1 20
10	4 75		.366	40 06	8	1 25
11	5 75		.378	45 02	8	1 50
12	6 50		.378	49 00	8	2 50
13	7 75		.378	54 00	8	
14	9 00		.378	58 00	8	
15	10 00		.378	62 00	8	

Extra Strong, double above list.

Double Extra Strong, double list of Extra Strong.

LAP WELDED BOILER TUBES.

Size, Outside Diameter inches	1	1¼	1½	2	2½	3	3½	4	4½	5	6	7	8	9	10	11	12
Price per Foot	23	23	23	22	25	28	34	52	60	72	100	1 45	1 85	2 22	2 75	3 25	3 55
Price, Lap-Welded Drive Pipe	16	16	16	15	17	22	30	50	60	86	1 10	1 20	1 60	2 20	3 00	4 00	4 50

DRIVE PIPE SHOES.

	6"	8"	10"	12"
Long. Separate	13 00	16 00	20 00	26 00
" Shrunk on pipe	16 00	18 00	25 00	30 00
Short, Separate	12 00	14 00	17 00	22 00
" Screwed on pipe	13 00	15 00	19 00	24 00

DRIVE PIPE HEADS.

	6"	8"	10"	12"
	12 00	15 00	18 00	22 00

LAP WELDED CASING.

Size, Inside Diameter Nominal	4	4½	5	6	7	8	9	10	11	12
Price per foot	38	41	45	58	72	86	1 00	1 30	1 60	2 00
Price, Lap-Welded Drive Pipe	31	34	38	48	60	74	86	1 10	1 30	1 60

Tarred or Asphalt and Kalamein Pipe, list and discount furnished on application.

WEST'S

MOULDERS' TEXT-BOOK:

BEING PART II OF

AMERICAN FOUNDRY PRACTICE.

Presenting best methods and original rules for obtaining good, sound, clean castings, and giving detailed description for making moulds requiring skill and experience.

Also containing a practical treatise upon the construction of cranes and cupolas and the melting of iron and scrap steel in iron foundries. By

THOMAS D. WEST,

Practical iron moulder and foundry foreman a member of the American Society of Mechanical Engineers and of the Civil Engineers' Club of Cleveland Ohio.

12mo. Cloth, $2.50

Fully illustrated and with complete index Will be mailed, prepaid, on receipt of the price.

On receipt of $3.00 we will send the above book and the IRON TRADE REVIEW for one year

Address:

CLEVELAND PRINTING AND PUB. CO

CLEVELAND, OHIO.

Iron Clad Paint Co.

Factory 75 & 77 Central Way. Sec & Treas. No. 3 Case Building.

CLEVELAND, OHIO.

Trade Mark Patented—Paint Peerless

Order direct from the Iron Clad Paint Co.,

And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green and now owned by this Company.

IRON CLAD PAINT is the most durable, most fireproof and Cheapest Paint made.

FURNISHED both Dry and Ground in Oil.

Used by Nearly all the Railroads. 63

Cleveland Co-Operative Stove Company.

——MANUFACTURERS OF——

Stoves, Hollow Ware and Plumbers' Sinks.

PRINCIPAL HOUSE:

26 to 36 SUPERIOR STREET, On the Viaduct, CLEVELAND, O.

BRANCH HOUSES: Chicago, Ill. Indianapolis, Ind. St. Louis, Mo.

REPOSITORIES: Des Moines, Ia. Minneapolis, Minn. Kansas City, Mo.

02-1m

Cleveland Foundry

Castings

For Machinery and Rolling Mills

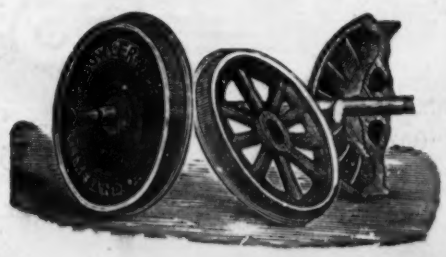
Car Wheels

All sizes and kinds, with and without Axles.

Chilled Faced R. R. Frogs

STREET RAILROAD TURNOUT.

Nos 9, 11 & 13 Winter Street. } Bowler & Co



N. D. Fisher, Prest. & Gen. Mgr. F. L. Fisher, Vice Prest. & Treas. A. M. Allyn, Sec.

—THE—

Fisher & Wilson Co.

WHOLESALE

Pine & Hardwood

Lumber Dealers,

47 CENTRAL WAY,

Cleveland, O.

Fine Hardwood Finishing Lumber a Specialty.

PLAIN OAK, QUARTERED OAK, ASH, CHERRY, WALNUT, YELLOW POPLAR, HICKORY, RED BIRCH, ROCK MAPLE, BIRD'S EYE MAPLE, WHITE MAPLE, BEECH, ELM, SOUTHERN PINE.

Bridge and Car Timber Cut to Order. 42

F. E. Drury, Pres't. H. P. Crowell, Sec'y.

THE

Cleveland Foundry CO.,

CLEVELAND, O.,

Manufacturers of

Light Gray Iron Castings,

Japaning, Electro-Plating in Nickel, Bronze and Copper.

Hardware Specialties made on Contract.

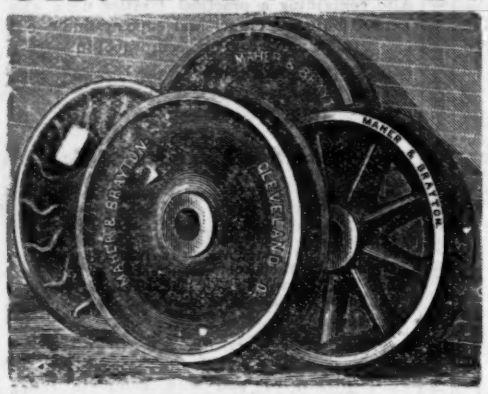
We solicit correspondence and samples for estimate.

OFFICE AND WORKS ON

Platt St. and C. & P. R. R

☞Take Woodland cars to Carr St. 421y

CLEVELAND WHEEL & FOUNDRY WORKS.



MAHER & BRAYTON, Proprietors.

Manufacturers of

Car, Engine, Truck and Tender Wheels.

RAILROAD, ROLLING MILL and Machinery Castings.

and Street Railroad Wheels and Turnouts.

ALSO

Chilled-Faced Railroad Frogs.

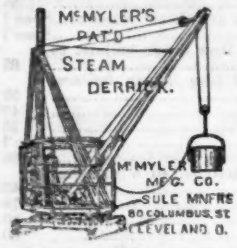
Office: 20 Carter Street.

Works: Cor. Carter and Collins Streets

Cleveland Ohio.

McMYLER MANUFACTURING CO.,

180 Columbus St., Cleveland, O.



SOLE MANUFACTURERS OF THE

McMYLER PATENT

Revolving Steam Derrick,

AND THE

SEATON RIVET and BOLT HEADER.

Also General Hoisting and Conveying Machinery, Coal and Ore Buckets and Dump Cars.

811y

GARRY IRON ROOFING COMPANY,

The Largest Manufacturers of Iron Roofing in the World,

MANUFACTURERS OF ALL KINDS OF

Iron Roofing, Crimped and Corrugated Siding, Iron Tile or Shingle, Fire-Proof Doors and Shutters, Iron Ore Paint and Cement.

Iron Frames for Roofs and Buildings.

No. 152 MERWIN ST., CLEVELAND, OHIO.

☞ Send for circulars and price list No. A

C. H. PRESLEY & CO., Office, 24 So. Water St. CLEVELAND. O.

Tools, Supplies and Machinery.

AGENCIES:

STERLING EMERY WHEEL CO.,

Emery and Corundum Wheels.

BICKFORD DRILL CO.,

UPRIGHT DRILL PRESSES.

CHAMPION BLOWER & FORGE CO.,

Blowers, Exhausters, Forges, &c.

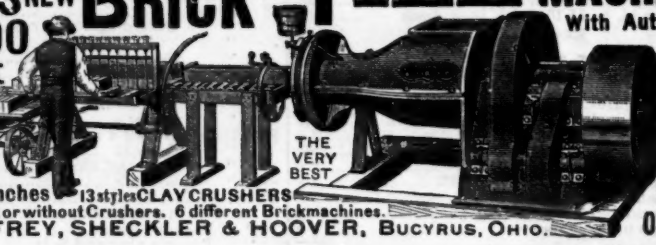
I. B. WILLIAMS & SONS,

Oak Tanned Leather Belting, R. H. Lace.

FREY'S NEW BRICK AND TILE MACHINE

40,000 BRICK PER DAY

TILE from 1 to 20 inches



With Automatic CUT OFF.

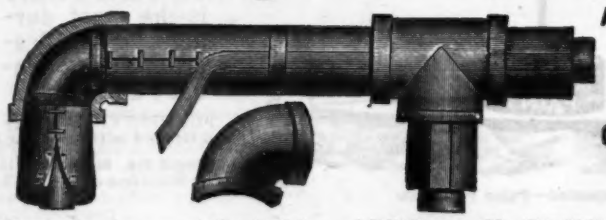
13 styles CLAY CRUSHERS

Engines and full Factory OUTFITS

Machines with or without Crushers. 6 different Brickmachines.

ADDRESS FREY, SHECKLER & HOOVER, BUCYRUS, OHIO.

Steam Pipe and Boiler Coverings.



The above cut represents Reed's Celebrated Sectional Covering.

Mention this paper.

Asbestos Cements,

Mineral Wool Hair Felt,

Coverings and Asbestos Goods of all kinds.

JOHN A. McCONNELL & CO.,

61 Water Street, PITTSBURGH, PA.

THE ÆTNA MACHINE COMPANY,

SOLE MANUFACTURERS OF THE

Aetna Medium and High Speed Engines.

300 to 1000 Horse Power. Latest Design.

For Rolling Mills, Furnaces, Pipe Works, Grist and Saw Mills, Etc. Also Manufacturers of

Upright Engines from 10 to 150 H. P.

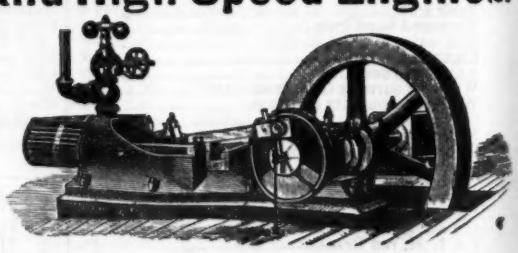
Rolling Mill and Special Machinery, Light and Heavy Castings, and

M. V. SMITH'S

Gas Producer and Furnace.

ENGINES ALWAYS IN STOCK.

Warren, - Ohio.



Cambridge Roofing Co.,

Manufacturers of

CROWL'S PATENT STANDING SEAM,

Plain Rolled, Corrugated and Crimped Edge,

Roofing, Siding and Ceiling. Made of Steel and Charcoal Iron, awarded First Medal by the New Orleans Exposition.

CAMBRIDGE - OHIO

P. L. SWORD.
C. D. SWORD.

AUTOMATIC DOUBLE PRESS BRICK MACHINE.

PATENTED AUG. 24. '84

P. L. SWORD & SON.

IMPROVED BRICK MACHINE.

CLAY CRUSHERS, CARRIERS.

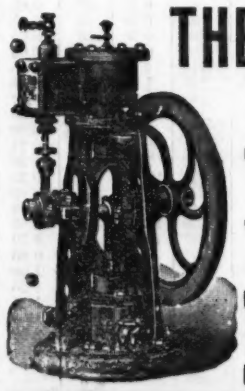
BARROWS & BRICK YARD SUPPLIES.

PORTABLE Hake & Truck.

OFFICE & WORKS, Bessemer Ave

Nos EUCLID AVE, ROOM 4.

Cleveland, O.



THE LAIDLAW & DUNN CO.,

CINCINNATI, O.

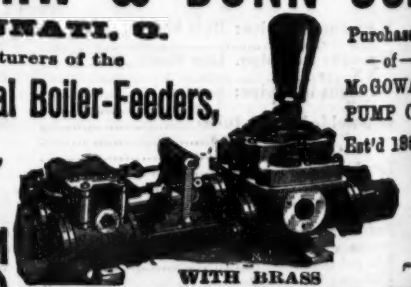
Manufacturers of the

"Hero" Vertical Boiler-Feeders,

—AND—

"STANDARD" DUPLEX

PUMPS



WITH BRASS REMOVABLE WATER CYLINDERS.

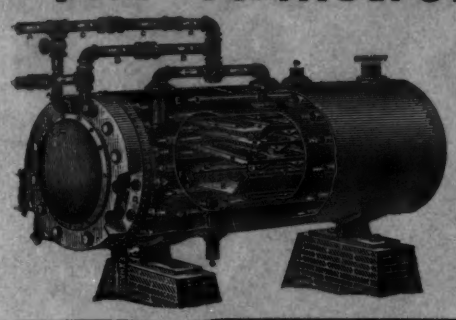
Purchasers —of— McGOWAN PUMP CO Est'd 1862

Send for descriptive circulars.

The Armstrong Purifier,

WITH

Exhaust Heater Combined,



Purifies the feed water by means of the live steam, and heats the water up to the boiling point by means of exhaust steam.

A full description of this heater, together with a valuable treatise on steam boilers, sent to any address, free of charge. Address,

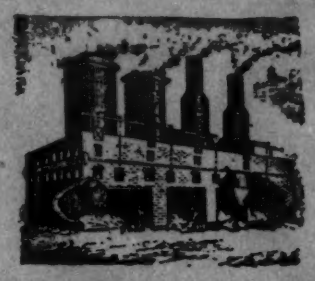
W. C. ARMSTRONG & CO.,

131y SPRINGFIELD, O.

Sandusky Metal Works.

FRED KRANZ, Proprietor.

Manufacturer of



IRON LIME KILNS,

Copper, Sheet Steel and Sheet Iron Work for Brewers and Distillers.

PLUMBING, GAS AND STEAM FITTING.

STEAMBOAT WORK A SPECIALTY.

OFFICE: 731 Water St.

04-1y SANDUSKY, Ohio.

WORSWICK MFG. CO.

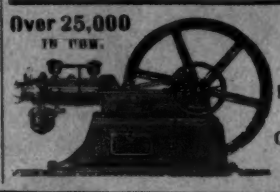
MANUFACTURERS OF MALLEABLE AND CAST IRON FITTINGS,

AND BRASS GOODS. Jobbers of Plumbers', Gas and Steam Fitters' Tools and Supplies.

Sole manufacturers of **The Worswick Patent Radiators.**

AGENTS FOR IRON PIPE AND BOILER TUBES.

Corner Water and St. Clair Streets, 42 CLEVELAND, O.



OTTO GAS ENGINE WORKS

Schleicher, Schumm & Co., {Philadelphia. Chicago.

Horizontal OTTO Gas Engines.
Vertical OTTO Gas Engines.
Twin Cylinder OTTO Gas Engines.
Combined OTTO Gas Engine Pumps.
Combined OTTO Gas Engine Dynamos.

SIZES: 1, 2, 4, 7, 10, 15, 25 and 50 horse-power.

SEBASTIAN, MAY & COMPANY'S Improved Screw Cutting Foot or Power Lathes.

Catalogue of Lathes, Drill Presses & Machinists' Tools and Supplies mailed on application. Lathes on Trial.

164 W. Second St.,

44-1y CINCINNATI, O.

W. BINGHAM & CO.,

146, 148 & 150 Water St.,

CLEVELAND, O.

Hardware, Iron, Nails and Metals

OF EVERY DESCRIPTION.

RAILWAY, MACHINISTS' AND MINERS' SUPPLIES.

Wm. Jessop & Sons and Peter Stubs' Celebrated Cast Steel.

Malleable and Cast Gas and Water Fittings.

Nathan & Dreyfus' Self-Acting Oilers and Lubricators, Injectors and Ejectors; Pennsylvania Tube Works Pipe and Boiler Flues; Peet's Open Way Valves; Boston Belting Co.'s Rubber Belting, Packing and Hose; Alexander Bros.' Leather Belts.

STUBS, GROBET & ROTHERY FILES, ETC., ETC

AUTOMATIC

Vertical Engines,

Especially designed for

Small Electric Light Plants.

Perfect Regulation.

5 to 20 Horse Power.

Send for Specifications and Prices.

LLOYD & GRIFFITH,

Erie, Pa., U. S. A.

Mention this paper. 131y

LATEST IMPROVED

Western Washer

This Machine is now in the hands of

Sold Strictly on its Merits.

Five Thousand Dealers,

And in use in more than 75,000 Households. We guarantee satisfaction with each machine. "It meets with profitable and satisfactory sale everywhere." A good margin in it for dealers. Write for catalogue and terms to

The Horton Mfg. Co., - Ft. Wayne, Ind.

THE Brush Electric Co.,

SOLE MANUFACTURERS UNDER ALL THE

Patents of Charles F. Brush, for Electric Lighting, Storage Batteries, Carbons, Electro-Plating Machines, Electro Motors, Etc.

THE BRUSH LIGHT STILL LEADS THE FIELD.

No other System in the World equals ours in Simplicity, Durability, Earning Capacity, Reliability. The Best is always the Cheapest. 45,000 Brush Arc Lamps now in use. Self-Regulating Incandescence Apparatus.

GET OUR AGENT TO MAKE PLANS FOR YOU BEFORE BUYING ELSEWHERE.

THE BRUSH ELECTRIC CO.

CLEVELAND, OHIO, U. S. A.

AGENCIES EVERYWHERE. 93

SPENCERIAN STEEL PENS

Are The Best

Established 1860.

USED BY THE BEST PENMEN

Noted for Superiority of Metal, Uniformity, and Durability.

30 Samples for trial, post-paid, 10 Cents.

IVISON, BLAKEMAN, TAYLOR, & CO., 753 and 755 Broadway, New York.

NEW OTTO RUBBER TIRE

BICYCLES.

NO STRONGER BICYCLE MADE.

A. W. GUMP & CO., Dayton, O.

52 inch, factory price $60.00,	our price	$40 00.
50 " "	55.00,	" "	35 00.
48 " "	50.00,	" "	33 00.
46 " "	45.00,	" "	30.00.
44 " "	40 00.	" "	27.00.

Order quick. Also 250 second-hand Wheels. Repairing and Nickeling. Bicycles and Guns taken in trade.

SHEPARD'S NEW $60

SCREW CUTTING

FOOT LATHE,

Foot and Power Lathes, Drill Presses, Scroll-Saw Attachments, Mandrels, Chucks, Twist Drills, Dogs, Calipers, etc. Lathes on trial. Lathes on payment. Send for catalogue of Outfits for Amateurs or Artisans. Address H. L. SHEPARD, Agt., 124 East Second St., Cincinnati, O.

Champion Rubber Bucket

CHAIN PUMP.

Manufactured by **S.E.Crawford**

NORWALK, OHIO.

Chain Pump Pipe Buckets, Common & Expansion, Wood Force Pumps; also dealer in Steel Chain—best quality. Special inducements to parties ordering car lots. Correspondence solicited.

E. E. GARVIN & CO.,

Manufacturers of

Machinists' & Iron Workers' Tools

LATHES, PLANERS, MILLING MACHINES AND DRILLS.

We received Gold Medal for our New UNIVERSAL MILLER at the N. O. Exposition. (See cut.)

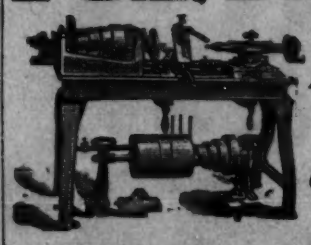
Special Tools for all kinds of Manufacturing to order. Gear and Rack Cutting, Milling and Index Drilling to order.

139-143 Center St., NEW YORK.

Fox, Turret and Speed

LATHES

And Brass Finishers' TOOLS.



CAGE MACHINE WORKS,

Waterford, New York.

S. M. York, Agent. 42, 44 & 46 S. WATER ST CLEVELAND, O.

WEBER & LIND SIGN WORKS.

Artistic Signs.

Cor. Ontario & Huron Strs.,

CLEVELAND, O.

Show Cards; Silk Banners, Bunting, Flags and Streamers; Picture Painting; Carved Wood; Metal, Glass and Cloth Signs. 05

MUGLER & KRAUS,

ENGRAVERS - ON - WOOD,

89 Euclid Avenue,

Telephone 2240 CLEVELAND, O.

STEEL CASTINGS

FROM ¼ TO 15,000 Lbs. WEIGHT,

TRUE TO PATTERN, sound, solid, free from blow-holes, and of unequalled strength. Stronger and more durable than iron forgings in any position, or for any service whatever. 40,000 Crank Shafts and 30,000 Gear Wheels of this steel now running prove this. Cross-Heads, Rockers, Piston Heads, etc., for Locomotives. STEEL CASTINGS of every description. Send for Circulars and prices to

CHESTER STEEL CASTING CO.,

WORKS: Chester, Pa. OFFICE: 407 Library St., Philadelphia, Pa

Patents.

H. T. FISHER,

SOLICITOR AND COUNSELOR,

Late Examiner U. S. Patent Office. Eight years experience in Examining Corps. Prices moderate. Satisfaction guaranteed. Write or call for particulars. [05]

34 Blackstone Building, CLEVELAND, O.

THE AMERICAN
Manufacturing, Mining & Milling Co.,

MANUFACTURERS OF ALL KINDS OF GOLD AND SILVER

Mining Machinery

CLEVELAND, OHIO.

SPECIALTIES.—The Linn Double-Jaw Rock Breaker and Ore Crusher; The Standard Pulverizer (for wet pulverizing); The Crescent Pulverizer (for either wet or dry pulverizing) Howland's Rapid Amalgamator; Secor's Improved Amalgamating Pan (for treatment of refractory ores); Howland's Improved Disintegrating and Concentrating Riffles.

Agents Wanted. Correspondence Solicited. Catalogues Sent on Application.

J. SMITH. H. E. TEACHOUT. F. W. SMITH.

SMITH & TEACHOUT,

Manufacturers of **BOILERS, TANKS and STILLS** of all Descriptions.

REPAIRING PROMPTLY EXECUTED. PLATE AND SHEET IRON WORK. ALSO FLUES TAKEN OUT, PIECED AND RESET. NEW FLUES ON HAND.

644 and 646 Broadway. Telephone 1121. [91-1y] CLEVELAND, O.

NILES BOILER WORKS,

MANUFACTURERS

STEAM BOILERS.

Blast Furnaces, Tanks, Stacks, Stills, Agitators, Car Tanks, etc.

Correspondence solicited.

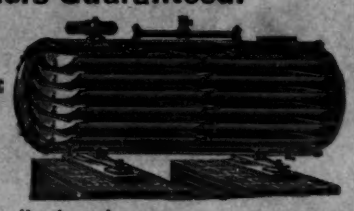
REEVES BROS., Props.,

27ly NILES, Trumbull Co., O

The HOPPES Feed-Water PURIFIER.

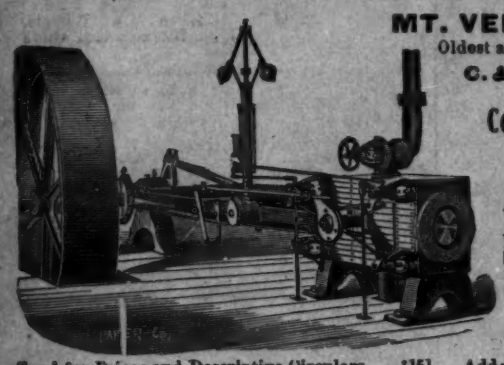
Sold on Trial. Clean Boilers Guaranteed.

SEND FOR DESCRIPTIVE CIRCULAR A



Hard Sheet Steel Troughs easily cleaned.

HOPPES MANUFACTURING CO., - - Springfield, Ohio.



MT. VERNON IRON WORKS,

Oldest and Largest Works in the Country.

C. & C. Cooper & Co., Prop's.

Manufacture

Corliss Automatic Cut-off Engines,

50 to 450 Horse Power.

Slide Valve Stationary Engines

All Sizes, Extra Heavy, with Girder, Box Frame.

PORTABLE ENGINES, Center and Side Crank, 6 to 40 H. P.

TRACTION ENGINES, 8 to 18 H. P.

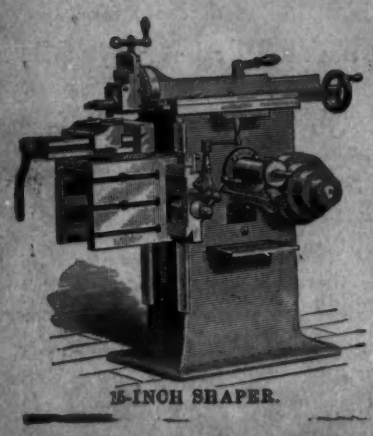
SAW MILLS, Extra Heavy, Standard and Pony, with Self-receding Blocks and Late Improvements.

Tubular, Locomotive and Flue Boilers.

Send for Prices and Descriptive Circulars. [15] Address C. & C. COOPER & CO., Mt. Vernon, O

I. H. Pratt, Agent, 89½ St. Clair St. Cleveland, O.

Shapers, Engine Lathes and Drills.



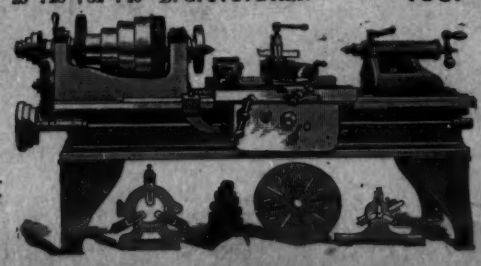
15-INCH SHAPER.

LODGE, DAVIS & CO.,

Cincinnati, O. SEND FOR PRICES.

15", 20", 26", 32" Shapers,
17", 19", 21", 24", 27" Engine Lathes
20", 24" Upright Drills,
25", 28", 32", 40" B. G. P. F. Drills.

IT WILL PAY YOU.



The STANDARD TOOL Co.,

CLEVELAND, OHIO,

Manufacturers of

INCREASE TWIST DRILLS, &c.,
TAPER SHANK DRILLS,
Straight Shank Drills,
Machine Bit Drills,
Screw Driver Bits,
Bit Stock,

Sockets,
Hand and Shell Reamers,
Standard Gauges,
Milling Cutters and Special Tools, Morse Taper Reamers.

—— Standard Patent ——

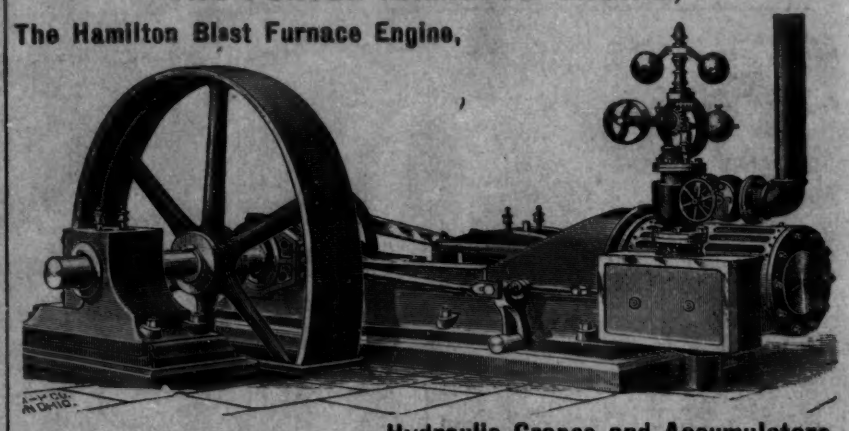
Twist Drill Grinding Machine.

New York Office, 33 Chambers Street.

William Tod & Co., Youngstown, O.,

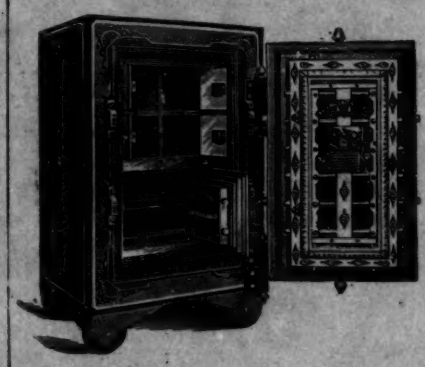
THE PORTER-HAMILTON ENGINE,

The Hamilton Blast Furnace Engine,



Hydraulic Cranes and Accumulators.

☞Heavy special machinery generally. Send for illustrated catalogue.



—NATIONAL— SAFE & LOCK CO.,

BRAINARD BLOCK,

North Side Public Square, - Telephone 399.

CLEVELAND, O.

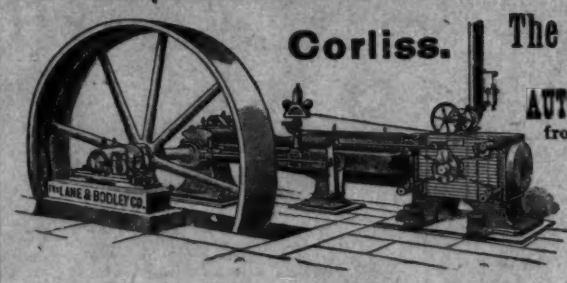
—MANUFACTURERS OF—

Fire & Burglar Proof Safes,

BANK VAULTS, SAFETY DEPOSIT BOXES, TIME AND COMBINATION LOCKS.

WORKS,

C. & P. R.R., bet. Garden & Quincy Sts.



Corliss.

The Lane & Bodley Co.

Manufacturers of

AUTOMATIC CUT-OFF ENGINES

from heavy patterns and of unexcelled workmanship.

STEEL BOILERS,

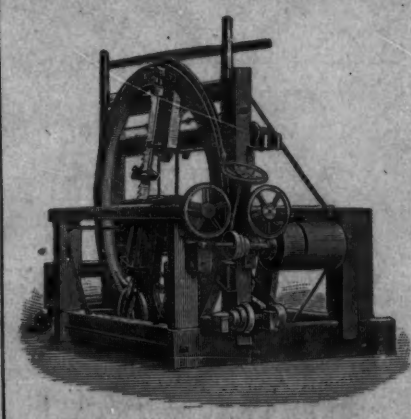
Feed Water Heaters,

SHAFTING, PULLEYS, GEARING

THE LANE & BODLEY CO.

Nos. 1 to 25 John Street.

CINCINNATI, O.



C. J. McNUTT, Ashtabula, O.

MANUFACTURER OF

BEVEL JIG MILLS

For Ship Builders.

The Best and Cheapest Mill on the Market.

No ship yard should be without this Machine.

SEND FOR PRICE LIST & CIRCULAR.

For First Class STEAM BOILERS, STACKS, SHEET IRON & PLATE WORK, Oil and WATER TANKS.

BOILERS

ADDRESS: ENTERPRISE BOILER Co. YOUNGSTOWN, OHIO.